W. W. DAWSON, M. D.

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PRACTICAL SURGERY.

PART I.

CONTAINS,

INFLAMMATION.—ARTERIOTOMY.—PHLEBOTOMY.—SUPPURATION.—ABSCESS.—ULCERS.—DISSECTING-ROOM WOUNDS.—MORTIFICATION.—DISEASES OF THE ARTERIES, ANEURISM.—OF THE VEINS, HEMORRHAGE.—OF THE BONES, FRACTURES.—OF THE JOINTS, LUXATIONS.—GUNSHOT WOUNDS.—AMPUTATION.

PART II.

Including the rest of the SURGICAL DISEASES, will appear in *December*.

A SYSTEM

OF

W. W. Dawson

PRACTICAL SURGERY,

WITH

NUMEROUS EXPLANATORY PLATES,

THE DRAWINGS AFTER NATURE.

BY

JOHN LIZARS,

PROFESSOR OF SURGERY TO THE ROYAL COLLEGE OF SURGEONS, AND LATELY SENIOR OPERATING SURGEON TO THE ROYAL INFIRMARY OF EDINBURGH.

PART I.

EDINBURGH:

W. H. LIZARS; S. HIGHLEY, LONDON; W. CURRY JUN. & CO. DUBLIN.

MDCCCXXXVIII.

H. & J. PILLANS, PRINTERS, EDINBURGH.

To the **President** and **Fellows** of the
Royal College of Surgeons, Edinburgh.

Gentlemen,

Ever since I have been engaged in the duties of the Professorship, with which you collectively honored me, I have felt the want of a Book containing each Surgical Disease and the corresponding Operation, succinctly and correctly delineated; so as to be a useful guide to the Student, and remembrancer to the Practitioner. How far I have supplied the deficiency by the present Work, I submit to your superior judgment. For the distinction however which you conferred on the Author; and for the zeal and intelligence with which you promote the study of that department of the Healing Art, which is certainly not the least interesting and important.

—This production, such as it is, is Inscribed to you, with the gratitude and esteem of— Gentlemen,

Your most obedient Servant,

John Lizars—

33 York Place, Edinburgh,

October 1838.

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DESCRIPTION OF PLATES.

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Fig. 1.—Represents the mode of puncturing with a lancet the skin affected with erythema or erysipelas.

Fig. 2.—A scarificator. The lancets projecting through *a*, the surface which is applied to the skin. *b*, the handle or trigger. *c*, the spring.

Fig. 3.—A glass cup.

Fig. 4.—A spirit lamp.

Fig. 5.—A straight sharp-pointed bistoury.

Fig. 6, 7, 8.—Cauteries of different shapes.

Fig. 9.—A moxa and handle.

Fig. 10.—A lancet.

PLATE II.

Fig. 1.—Illustrates arteriotomy. *a*, wound of temporal artery.

Fig. 2.—Compress used after arteriotomy.

Fig. 3.—Manner of bandaging the head after arteriotomy.

Fig. 4.—Represents phlebotomy. *a*, wound of external jugular vein.

Fig. 5.—Represents phlebotomy. *a*, wound of median basilic vein. *b*, bandage round arm to render the vein turgid.

Fig. 6.—Manner of bandaging the arm after blood-letting. *b*, the bandage. *c*, the compress.

Fig. 7.—Exemplifies mode of incising the integuments in erysipelas phlegmonodes.

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Fig. 3.—A tourniquet.

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Fig. 5.—Curved needle of Petit, used to secure an artery imbedded in dense tissues.

Fig. 6.—Artery forceps with a catch spring.

Fig. 7.—Curved probe-pointed bistoury.

Fig. 8.—Straight probe-pointed bistoury.

Fig. 9.—Aneurism-needle.

Fig. 10.—Scalpel.

Fig. 11.—Needle employed in stitching wounds.

Fig. 12.—Tenaculum.

Fig. 13.—Dissecting, operating, or artery forceps.

PLATE IV.

Fig. 1.—View of preliminary incisions for carotid and axillary aneurisms. *a*, that for subclavian artery. *b*, that for carotid artery.

Fig. 2.—Sailor's reef-knot, adopted in securing an artery.

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Fig. 4.—Enlarged view of subclavian operation. *a*, subclavian artery. *b*, aneurism needle elevating the artery. *c*, sterno-mastoid muscle. *d*, external jugular vein. *e*, deep cervical fascia. *f*, omo-hyoid muscle. *g*, transversalis colli vein. *h*, long respiratory nerve. *k*, supra-scapular artery.

PLATE V.

Fig. 1.—View of preliminary incision for arteria innominata. *c*, the incision.

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Fig. 3.—View of ulnar and radial arteries affected with aneurism by anastomosis. *a*, radial artery. *b*, ulnar artery. *c*, *c*, *c*, superficial palmar arch varicose or aneurismal.

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Fig. 3.—Enlarged view of superficial femoral operation. *a*, superficial femoral artery. *b*, sheath of vessels. *c*, *c*, internal saphenous nerve. *g*, *g*, fascia lata femoris. *d*, *d*, *d*, *d*, integuments of thigh.

PLATE VIII.

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Fig. 5.—Caries of os calcis. *a*, carious portion.

Fig. 6.—Spina ventosa of carpal extremity of radius. *a*, spina ventosa.

Fig. 7.—Carious cranial bones. *a*, *a*, carious foramina in frontal and parietal bones.

Fig. 8.—Cutting pliers, or Liston's forceps.

Fig. 9.—Bone pliers, or necrosis forceps.

Fig. 10.—Pliers which separate and lock like midwifery forceps. *a*, a pivot on one limb. *b*, a spring on the other limb.

Fig. 11.—Hey's or Cockell's saw.

PLATE IX.

Fig. 1.—Mode of placing a fracture of tibia, or tibia and fibula, on Liston's Splint, and bandaging it. *a*, supposed line of fracture of tibia left uncovered by the bandage. *b*, *b*, the coils of the bandages. *n*, the leg piece of splint. *g*, the thigh piece of splint. *h*, a simple hook and eye hinge. *c*, a thick worm screw. *f*, the foot board of splint. *d*, a nut, to fix the foot-board which slides in the groove. *o*, *e*, an iron plate on which the splint rests, and which moves on a pivot *p*.

Fig. 2.—Comminuted fracture of the tibia. *a*, *a*, *a*, indicates the fracture.

Fig. 3.—Compound fracture of the tibia. *a*, the protruded portion of bone.

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Fig. 5.—United fracture of neck of thigh bone. *a*, *a*, line of fracture. *b*, head of bone. *c*, trochanter major. *d*, trochanter minor.

Fig. 6.—United fracture of clavicle sawn through. *a*, *a*, *a*, site of fracture.

Fig. 7.—Mode of placing fractured os humeri, ulna, and radius. *a*, *a*, *a*, *a*, piece of pasteboard nearly surrounding arm, notched or hinged at elbow-joint. *b*, *b*, bandages.

PLATE X.

Fig. 1.—Mode of reducing luxation of shoulder-joint. *a*, the dislocated joint. *b*, the heel of the operator in axilla. *c*, the skein of worsted, in the figure of the sailor's double clove hitch, round the arm. *d*, the leg of the operator. *e*, *e*, the hands of an assistant grasping the fore-arm, and rotating the arm.

Fig. 2.—Representation of unreduced luxation of the left elbow-joint. *a*, the head of radius. *b*, olecranon ulnæ. This diagram illustrates the accident best when the plate is turned, so that the arm be perpendicular, instead of horizontal.

Fig. 3.—Represents the manner of reducing luxation of hip-joint, when the head of the thigh-bone is upon the dorsum of the os ilium. *a*, *a*, *a*, the sheet round the perineum. *b*, *b*, the worsted in the figure of the Sailor's double clove hitch. *c*, *c*, the ends of the worsted, which are fixed to the hook *b* in fig. 4. *d*, the left hand of the surgeon grasping the thigh, and *e*, his right hand the ankle, to rotate the os femoris.

Fig. 4.—The pulley apparatus. *a*, *a*, the pulleys or blocks with the cords *d* running through them, and the free end marked *e*. *b*, the hook round the worsted *c*. *f*, the other hook through a staple or iron ring *g*, in pillar *h*.

PLATE XI.

Fig. 1.—Preliminary sketch of amputation of first phalanx of a finger. *a*, left hand of operator grasping the third or last phalanx *k* of ring finger to be removed. *b*, right hand of operator holding the bistoury, *e*, and incising the skin over the joint. *c*, *c*, *c*, hands of an assistant keeping the other fingers of the hand *d* out of the way of the knife.

Fig. 2.—Enlarged view of preceding operation. *e*, *e*, bistoury after the joint, *f*, *f*, *f*, has been dislocated, about to make a flap of the palmar aspect of the finger, *g*.

Fig. 3.—Preliminary sketch of amputation of fore-finger between first and second phalanges. *a*, left hand of operator grasping the fore-finger *g* to be removed. *b*, *b*, right hand of operator holding the bistoury *e*, and incising the skin over the joint. *c*, *c*, hands of assistant keeping the other fingers of the hand *d* out of the way of the knife.

Fig. 4.—Enlarged view of preceding operation. *e*, *e*, the bistoury inserted into the joint, *f*, *f*, *f*, and about to make the palmar flap of the finger *g*.

Fig. 5.—Preliminary sketch of amputation of middle finger at its articulation with metacarpal bone. *a*, left hand of operator grasping the finger *h* to be removed. *b*, the right holding the bistoury *e*, and incising by the side of the finger *h* into joint. *c*, *c*, hands of assistant keeping the other fingers aside.

Fig. 6.—Enlarged view of preceding operation. *e*, the bistoury after having divided the ligaments of the joint, *f*, *f*, *f*, cutting the other lateral flap outwards along the side of the first phalanx.

PLATE XII.

Fig. 1.—First view of amputation of thumb. *a*, left hand of operator grasping the thumb *i* to be removed. *b*, right hand of operator holding the bistoury *e*, which is commencing the incision indicated by the dotted line *c*, *c*, *c*.

Fig. 2.—Second view. *c*, *c*, *c*, *c*, the sides of the wound. *i*, *i*, metacarpal bone of thumb. *o*, os trapezium.

Fig. 3.—First view of amputation at wrist-joint. *a*, left hand of operator grasping hand *d* to be removed. *b*, right hand of operator with the bistoury *e*, beginning the cutaneous incision marked with the dotted line *c*, *c*.

Fig. 4.—Enlarged view. *e*, the knife behind or palmad to the carpal bones *m*, *n*, about to make the flap from the palm of the hand. *m*, the os scaphoides. *n*, the os naviculare. *r*, *r*, the articular surface of radius. *c*, *c*, *c*, *c*, the divided integuments on back of wrist.

Fig. 5.—Preliminary sketch of amputation of fore-arm. *g*, *g*, hands of assistant compressing brachial artery. *a*, left hand of operator grasping the palmar flap. *e*, *e*, the amputating knife after it has transfixed the fore-arm. *c*, *c*, dotted line, indicating the palmar flap.

PLATE XIII.

Fig. 1.—Second view of amputation of fore-arm. *c*, *c*, *c*, *c*, *c*, the anterior or palmar flap turned upwards. *e*, *e*, the knife on the anconal or posterior aspect of radius *r*, and ulna *s*, about to make the posterior flap. *a*, the radial artery. *b*, the ulnar artery. *o*, the ulnar nerve.

Fig. 2.—First view of excision of elbow-joint. *c*, *c*, *c*, *c*, the four flaps of the integuments reflected back. *t*, a blunt hook holding aside the ulnar nerve *o*. *a*, the olecranon ulnæ. *b*, the inner condyle of the humerus.

Fig. 3.—Second view of excision of elbow-joint. *c*, *c*, *c*, the flaps of the skin. *i*, *i*, the saw inserted between the nerves and blood-vessels, and the articular surfaces *d*, *e*, of the radius and ulna to be removed. *d*, the articular surface of radius. *e*, the articular surface of coronoid process of ulna. *a*, the olecranon ulnæ. *f*, the articular surface of the humerus.

PLATE XIV.

Fig. 1.—First view of amputation at shoulder-joint. *a*, left hand of operator grasping the outer flap. *b*, right hand holding the bistoury *e*. *c*, dotted line indicating form of flap. *e*, the bistoury.

Fig. 2.—Second view. *o*, *o*, *o*, thumb and fingers of assistant grasping the inner flap and axillary artery. *e*, *e*, the knife on the inner or pectoral side of the humerus *g*, about to divide the parts to form the inner flap. *c*, *c*, the fleshy cushion of the outer flap. *m*, the glenoid cavity.

PLATE XV.

Fig. 1.—Manner of excising the great toe with its metatarsal bone. *a*, right hand of operator with bistoury *b*. *c*, *c*, line of incision along the

metatarsal bone and round the root of toe. *d*, left hand of operator grasping the toe.

Fig. 2.—Enlarged view of excising great toe. *c*, *c*, *c*, *c*, line of incision through the integuments. *a*, metatarsal bone. *e*, articular surface of internal cuneiform bone.

Fig. 3.—Preliminary incision for amputation across the foot between tarsal and metatarsal bones, named Hey's operation. *a*, right hand of operator holding bistoury *b*. *c*, *c*, *c*, line of incision round roots of toes. *d*, left hand of operator grasping flap of sole of foot.

Fig. 4.—Enlarged view of Hey's operation. *c*, *c*, *c*, *c*, line of incised integuments. *d*, *d*, *d*, *d*, *d*, flap of sole of foot. *f*, *f*, *f*, digital arteries.

PLATE XVI.

Fig. 1.—Third view of Hey's amputation across the foot. *d*, *d*, *d*, the plantar flap. *a*, *a*, the patellar flap. *e*, *f*, *g*, *h*, the tarsal bones. *e*, os cuboides. *f*, os cuneiforme externum. *g*, os cuneiforme medium. *h*, os cuneiforme internum. *i*, *k*, *l*, *m*, *n*, metatarsal bones. *i*, that of great toe. *k*, that of index toe. *l*, that of middle toe. *m*, that of ring toe. *n*, that of little toe.

Fig. 2.—View of Chopart's operation across the foot. *a*, *a*, upper or patellar flap. *b*, *b*, *b*, plantar flap. *c*, os astragalus. *d*, os calcis. *e*, os cuboides. *f*, os naviculare.

Fig. 3.—First view of amputation of the leg. *d*, the left hand of operator grasping the calf of leg. *a*, the right hand of operator with the knife *e*, about to make the flap, which is indicated by the dotted line *c*, *c*, *c*. *b*, a dotted line indicating the anterior incision.

Fig. 4.—Second view. *c*, *c*, *c*, popliteal flap. *b*, patellar incision. *f*, the tibia.

Fig. 5.—View of the stump. *f*, the tibia. *g*, the fibula. *c*, *c*, *c*, popliteal flap. *a*, posterior tibial artery. *b*, anterior tibial artery. *e*, *e*, *e*, gastrocnemial arteries.

PLATE XVII.

Fig. 1.—First view of amputation of thigh. *a*, *a*, hands of assistant grasping the limb, and compressing the femoral artery with his thumbs *b*, *b*, *c*, left hand of operator grasping the inner flap. *e*, *e*, indicates line of incision of inner flap. *d*, the amputating knife transfixing the thigh between the bone and inner flap. *f*, line of outer flap.

Fig. 2.—Second view of amputation of thigh—the sawing of the bone. *a*, the thigh. *b*, *b*, the fleshy flaps held back or retracted by an assistant's hands *c*, *c*. *d*, the right hand of the operator sweeping from heel to point with the saw *e*, *e*. *f*, the left hand of operator holding the remote part of the limb *h*. *g*, the bone.

Fig. 3.—View of the surface of the stump, with the flaps retracted. *a*, superficial femoral artery. *b*, its accompanying vein. *c*, the long perforating branch of the profunda. *d*, *d*, *d*, *d*, *d*, muscular branches. *f*, great sciatic nerve. *g*, end of thigh-bone.

PLATE XVIII.

Fig. 1.—First view of amputation at hip-joint. *c*, the right hand of assistant compressing the external iliac artery with the thumb on the brim of the pelvis. *d*, the left hand of assistant grasping the anterior flap, and following the amputating knife *e*, which has transfixed the thigh. *a*, *a*, *a*, dotted lines indicating the form and length of this flap

Fig. 2.—Second view of amputation at hip-joint. *a*, *a*, *a*, the anterior flap turned upwards to the abdomen. *e*, *e*, the knife behind the head *b* of the thigh-bone and the trochanters, about to make the posterior or popliteal flap. *d*, the superficial femoral artery with its accompanying vein. *f*, *f*, *f*, the muscular branches of the profunda. *g*, the internal circumflex branch.

OMISSIONS AND ERRATA.

In page 13.—Under *Terminations of Inflammation*, eleventh line from the bottom, *read* after "deposit,"—This also constitutes the termination, adhesion, as for example, when the serous membranes are inflamed.

In page 25.—Fourth line from the bottom, *for Blood-letting*, *read General Blood-letting.*

In page 38.—Seventh line from the bottom, *for* fig. 6, *read* fig. 7.

In page 42.—Third line from the top, *for* fig. 6, *read* fig. 7.

In page 112.—Twenty-first line from the top, after the word "bone," *read*, as delineated in Plate IV., fig. 1., letter *a*.

In page 147.—Twenty-first line from the top, at the end of *Fracture of Ulna and Radius*,—*read*, The radius and ulna in delicate children are sometimes bent like a twig or bow, and require to be made straight by bending them across the knee.

In page 152.—Third line from the top, after the word "urine," *read*, Some solitary instances have occurred of the ramus of the os pubis having been fractured, and the individuals recovering. One case came under my own observation, where the patient walked backwards like a crab many weeks.

In page 185.—Fifth line from the top, after "possible," *read*, I have this day been consulted for sprained knee-joint, which seems to consist in the laceration of a portion of the internal lateral ligament.

HISTORY

OF

SURGERY.

Surgery, compounded of χειρ and εργον, is that branch of the medical profession wherein manual operations form part of the occupation of the practitioner, and which for centuries constituted the exclusive province of the individual who professed it.

Although there cannot be a shadow of doubt that Surgery was at least coeval with Medicine, yet there is no account of any such operations before the siege of Troy, when that eventful strife immortalized in song the chirurgical deeds of Patroclus, as well as those of Podalirius and Machaon, the godlike sons of Æsculapius, for in that mortal contest the chiefs were as much renowned for their achievements in surgery as in war.

Æsculapius lived about the beginning of the Trojan war, and was instructed in medicine and surgery by Apollo, and the Thessalian Chiron, named also the Centaur. According to Diodorus Siculus, Æsculapius was the inventor of medicine and surgery, performed operations, and carried botany to perfection, as well as the use of medicines. In the earliest age all the parts of medicine were practised by one individual,

and that person was frequently either a demigod, a hero, or a prince.

When we consider the reckless spirit of untutored man, it is to be presumed that wounds, fractures, and luxations existed from the creation, and that consequently many surgical remedies originated nearly at the same time, for surgery and medicine must have been simultaneous with injuries and diseases.

From the fall of Troy, an interval of 700 years, to the Peloponnesian war, which was 431 years before the Christian era, we have no accurate account of surgery; it is only known that the Asclepiades exercised the art. The great Hippocrates, also a lineal descendant of Æsculapius, appeared at that time, and has handed down to us works not less celebrated in surgery than in medicine.

In Egypt, according to Herodotus, surgeons were divided, as in the present day, into oculists, capitists, dentists, &c.; and in Persia, A. M. 3483, the surgeons of Egypt were held in high repute. Democedes is mentioned as having become the principal favourite of Darius, and as having been loaded with honours and riches, merely for having succeeded in reducing the dislocated ankle-joint of the monarch. Xenophon states, that Cyrus had an excellently appointed medical staff. About 500 years before Christ, the celebrated medical school of Alexandria flourished, at which Herophilus and Erasistratus had the boldness to introduce the source of all its renown, the study of human anatomy; but in consequence of the destruction of the Alexandrian library, we possess few of the writings of these great men. They were the founders of particular sects. Galen and Cœlius Aurelianus collected all the scattered remains of their works, together with those of the other successors of Hippocrates. It is natural to suppose that surgery was far advanced during the reign of the Alexandrian school, when we consider the advantages then derived from dissection, and the many opportunities of practice which must have occurred in the campaigns of Alexander and his successors.

In Greece, during the time of Herophilus, there were Dietetic, Pharmaceutic, and operative practitioners; the sur-

geon was restricted to the use of the knife, and was not even permitted to treat wounds, ulcers, or tumours. At this time also prevailed the famous sects of empirics, dogmatists, &c.

Arcagathus, a Greek, was the first who performed operations at Rome, U. C. 535, but he operated so unskilfully that he received the appellation of executioner. Celsus, who lived during the empire of Augustus and Tiberius, greatly advanced both medicine and surgery, and condensed all that was then known into one small volume. Galen was the last author of distinction that practised physic and surgery at Rome, A. D. 160; he was educated at the Alexandrian school. Paulus Ægineta, who lived in 640, and practised at Alexandria and Rome, wrote an excellent work on Surgery, containing all the improvements of his day.

Nothing but a chaos presents itself from this time to the beginning of the 10th century. Torrents of northern barbarians inundated the Roman Empire, and swept civilization from the fairest provinces of Europe; and, almost in immediate succession, the hosts of Saracens, under Amrou, viceroy of Egypt, set fire to the noblest monument of antiquity, the Alexandrian library. Thus nearly three centuries, science, literature, and art were buried in oblivion; while war, and all its attendant horrors, raged from the Euxine to the Atlantic.

The Arabians, at last contented with their conquests, requested, in 820, the Greek Emperor to give them some of the best literary and scientific works. Among those sent were Galen's, translated into the Syrian language, in which astrology and superstition were mingled with medicine. In the works of Rhazes, Halyabbas, and Avicenna, we have no facts or remarks concerning surgery, which are not to be found in Galen, excepting those relating to spina ventosa. Shortly afterwards Avenzoar and Albucasis wrote on surgery.

In consequence of the despotism which overwhelmed Europe, all knowledge remained in obscurity; and even in Greece, theological controversies absorbed all other pursuits, until the middle of the 15th century, when it again began slowly to revive. In England, it was actually near the end of the 15th century before medicine was cultivated at Oxford as a science; and even at the medical schools on the Con-

tinent, the diploma of surgery was conferred after one year's study of anatomy. At the famous school of Salernum, where this law existed, and where there was compiled a system of medicine, entitled "Schola Salernitana," only one chapter is devoted to surgery, and that on fistulas. The degrees of bachelor and doctor had no doubt been conferred at Paris during the reign of Charlemagne, but generally on the clergy and monks, who practised physic at this epoch, and who were, in consequence of the barbarous anathema pronounced by the Council of Tours, in 1163, prohibited from performing operations; in consequence of this, surgery was again formally separated from medicine, and practised only by the most illiterate of the laity. *Ecclesia abhorret a Sanguine*, continued long a reason for preventing the study either of anatomy or the practice of surgery. Gilbertus Anglicus is the first who wrote on surgery in England, which was about the year 1300; he copied chiefly Rhazes. Bernardus Gordon, a native of Scotland, and John of Ardern, are said to have flourished at this period; the latter wrote a work, entitled the Chirurgery. From the 11th to the middle of the 15th century, numerous works were published, but all mere compilations, or extracts from Arabian authors; we ought to except, however, a treatise on Surgery, by Guido de Cauliaco, or Guy de Chauliac, professor at Montpelier, who lived at Avignon in 1363, which continued for many years the standard work in France; for from this time until the day of the great Paré, surgery was degraded to the lowest possible state. Paré, in the first editions of his works, styles himself 'Barbier chirurgien.' There were then bitter controversies carried on between the clerical physicians and the unfortunate barber surgeons. Vidus Vidius published a splendid Latin edition of Greek surgery in 1544. The great Paré, enlightened by the works of Vesalius, Fallopius, and Eustachius, wrote in 1585 an able work on surgery, founded on anatomy, which had been previously published in separate treatises. And in 1561, Pierre Franco, a celebrated lithotomist, published "Traité des Hernies, de la Pierre, de la Cataracte, et des autres maladies des Yeux," a work of considerable merit.

In Italy, there were several surgical authors. In 1563

Fallopius, an excellent anatomist, wrote a treatise "De Ulceribus et de Tumoribus præter Naturam;" and in 1597, Casper Tagliacotius wrote his remarkable work "De Curtorum Insitione per Chirurgiam." Marcus Aurelius Severinus wrote several surgical treatises in 1613; and in the same year, Fabricius ab Aquapendente, a profound anatomist and physiologist, wrote a system of Surgery. In 1616, Cæsar Magatus wrote a treatise on wounds; and Felix Platerus, in 1614, published his "Observationes in Hominum Affectibus Plerisque," a work of considerable merit; he is the first who treats of the malignant nature of carcinoma. In 1644, T. Bartholimus wrote a work on aneurism.

In Germany and Switzerland, surgery was in the hands of quacks until 1641, when Fabricius Hildanus and Scultetus flourished.

In Holland, the same quackery predominated until the days of Tulpius, J. V. Horne, and Ruysch. In England the College of Physicians was not founded until the reign of Henry VIII. in the beginning of the 16th century; but anatomy, which furnishes the only sound principles of both medicine and surgery, was not taught until the 18th century. Prior to this, the bishop of London and the dean of St Paul's sold licenses and diplomas to the clergy, laity, and quacks, to practise physic and surgery. Bartholomew's Hospital was not erected until Henry's reign. Surgery was then practised indiscriminately by barbers, farriers, and sow-gelders. Both in Paris and London, in the 16th, and even the beginning of the 17th centuries, the barbers' and surgeons' companies were incorporated. In 1676 Wiseman redeemed surgery, by publishing the result of his valuable observations during the civil wars, in his work, termed "Several Chirurgical Treatises."

In France and other countries, many insulated works were published about this time. In 1640, Covillard's "Traité Methodique des principales operations de Chirurgie." In 1681, F. Tolet's "Traité de la Lithotomie." Lambert of Marseilles wrote an excellent work on diseases of the bones, also "Commentaires et Œuvres Chirurgicales," in 1656 and 1677.

The eighteenth century opens with an era truly astonishing when compared with the preceding. In France there were Mery, Dionis, Duverney, J. L. Petit, F. Petit, Le Dran, Garengeot, La Faye, Lecat, La Motte, Louis, Maitre Jean, David, Frere Cosme, Portal, Ravaton, La Peyronie, Quesnay, Faure, Morand, Sabatier, Pouteau, Moreau, Deschamps, and Desault. France has just cause to boast of having given birth to so many able men.

Great Britain, during this century, produced Chesselden, Douglas, Monro primus et secundus, Sharp, Cowper, Pott, Allanson, John Hunter, Hill, Warner, Ford, White, Broomfield, Ranby, Gooch, Park, O'Halloran, Dease, Latta, Benjamin Bell, John Bell, and a number of others.

I will now conclude this brief historical sketch, and refer the reader who wishes further information on this subject to the following treatises:—Meibomius; Hippocratis jusjurandum commentariis illustratum, 1643; Le Clerc Histoire de la Medicine, 1702; Friend's History of Physic, 1725; Histoire de la Chirurgie, par Peyrihle; Boerhavii Methodus discendi Artem Medicam; Haller Bibliotheca Chirurgica, 1774; Keistneri Bibliotheca Medica; Recherches historiques et critiques sur l'origine, les divers états, et les progres de la Chirurgie en France, par Quesnay; Gesner de Chirurgia scriptorum optimorum veterum et recentium; Gooch's practical treatise on wounds and other chirurgical subjects, together with a short historical account of the rise and progress of surgery and anatomy, 1767; Portal, histoire de l'Anatomie et de la Chirurgie, 1770; Black's historical sketch of Medicine and Surgery, 1782; Richerand Nosographie chirurgicale; Prolegomènes histoire abrégée de la Chirurgie; also, Histoire des progrès récens de la Chirurgie; Sprengel Histoire de la Medicine, 1815.

It may be interesting to make a few observations on the changes or revolutions which have taken place in the profession. At the beginning of medicine, one individual practised every department. It is evident that it was from Hippocrates's universal knowledge he so excelled; and it could have been only from a conscientious feeling of the difficulties attendant on lithotomy, that he separated it from the surgery he

wrote upon and practised. Surgery was then first partially separated from medicine, which circumstance must have degraded it, as the physician retained whatever was scientific. It appears, indeed, to have continued in the lowest condition until the time of Celsus, who, from his writings embracing both departments, and since he was the companion of the first men in Rome, must undoubtedly have raised surgery to a high rank in the estimation of the public. In consequence of dissection being proscribed at Rome, surgery gradually sunk, and particularly after the annihilation of the Alexandrian school, when it was again separated from medicine. We learn, from the scattered fragments collected by Galen and Cœlius Aurelianus, that surgery must have arrived at great perfection, and been in high estimation during the flourishing state of that school, where dissection was sanctioned by the government. It is evident, that surgery has only flourished in proportion as it was strictly connected with anatomical investigation, and enriched with medicine or pathological doctrines. At first it was combined with medicine, and in the days of Herophilus, and Erasistratus, Celsus, and Galen, it was also united with medicine and anatomy. After this, when anatomy could only be prosecuted by stealth, surgery continued in a truly deplorable condition, and in the 11th century, was stigmatized by the Council of Tours. In the 12th century, the school of Salernum, and also that of Naples, required only one year's study of anatomy for the diploma of surgeon. In the 15th century, we find the great Paré still a barber surgeon, and controlled by the physicians. At Oxford and Edinburgh, the two first universities in Great Britain, anatomical chairs were not established until the last century; and at neither school was dissection prosecuted until this century, and that only at Edinburgh, where the study was not sanctioned by Government till within the last six years. So that it was only at the dawn of medicine, and in the present era, that surgery, blended with physic, became a respectable profession. It is much to be regretted that there exists any separation, since it only tends to depreciate each, as physicians must be consulted in accidents, the province of the surgeon; and the surgeon must be ac-

quainted with the treatment of fever supervening to operation. All, therefore, ought to have the same elementary education, and be qualified for every department. The operating surgeon ought to dissect daily. Lately the College of Physicians of Edinburgh have wisely rescinded a law which prohibited their fellows from using the lancet or the scalpel. "Etenim omnes artes," says Cicero, "quæ ad humanitatem pertinent, habent quasi vinculum commune."

Arrangement.—The classification of surgical affections, according to the textures affected, as adopted by Smith, Pinel, and Bichat, is objectionable, because one disease affects many structures, and frequently proceeds from the one to the other. The arrangements adopted by Bell, Boyer, Richerand, and Allan, are all arbitrary. The simplest arrangement is, first, to treat of inflammation and its terminations, which may be said to constitute the principles of surgery; secondly, the different diseases of the sanguiferous system; thirdly, the diseases affecting the head, eye, nose, ear, mouth, neck, pharynx, and larynx; fourthly, the diseases of the thoracic cavity; fifthly, those of the abdominal and pelvic cavity, together with the organs of generation; sixthly, the diseases and accidents of the bones, and of the articulations; seventhly, wounds, burns, and scalds; lastly, adventitious or accidental productions, as tumors, &c. Properly speaking, in a nosological arrangement, these diseases should be arranged under certain classes and orders, and the operations come under their treatment.

PRINCIPLES OF SURGERY.

CHAPTER I.

INFLAMMATION.

Inflammation is a disease which, in a greater or less degree, follows accidents and all the operations of surgery. Inflammation is a term familiar in common language, and is derived from *inflammare*, to burn or inflame; an expression applicable enough, when we consider the kind of pain excited by a very violent degree of it, and the ideas formerly entertained of the temperaments of our bodies. Inflammation is indicated by pain, increased heat, redness, and swelling, which are caused by a morbidly increased action of the extreme nerves, capillary arteries, and veins; and in poisoned wounds, the lymphatics are also involved.

If these premises are correct, I would define Inflammation to be,—"an increased action of the extreme nerves and capillary blood-vessels of the part affected, in which the lymphatics are often involved." The nerves are first thrown into action, which instantly excite the contiguous arteries and veins, and as inflammation increases, the excitement extends to the brain and heart. The pain and heat are more dependent upon nervous than arterial action; in very slight degrees of inflammation, arising from some trifling injury, a sensation of warmth is only felt, in which case the inflammation is not completely established, since the phenomenon resembles more an increased

healthy action, or congestion, or hyperæmia. When inflammation is fully developed from a more severe injury, there is a thrilling pain and an intolerable sensation of heat at the moment of receiving it. And if the inflammation be so severe as to threaten mortification, the pain is insufferable. The degree of pain seems proportionate to the distribution of the nerves, and to the density or unyielding nature of the structure affected, which prevents the expansion of the neurilematous vessels; as is exemplified in toothache, inflammation of the skin, organs of sense, diseases of the bones, &c. The pain varies also in kind; thus, it is very acute and aching in toothache, hot and burning in erysipelas, and sharp and stinging in pleuritis.

To prove that increase of heat is also consequent chiefly on nervous action, a sensation of warmth is experienced instantly after the infliction of the pain, and if a severe blow or wound be received, the sensation of heat is intolerable at the moment of the injury; and not until the inflammation has lasted for some time, does the increased quantity of blood contribute to form the increased heat. The heat is also greater or less, according to the tissue affected, being greater when the organs of sense are inflamed, or where there is a profuse distribution of nerves, as the eye or skin.

The redness, which varies considerably in all inflammatory affections, according to the state of the constitution, frequently of a vermilion colour in erysipelatous, and a purple in phlegmonous inflammation,—is caused by the arteries carrying red blood, becoming enlarged in their calibre, and conveying more; and also by those arteries which previously conducted pale blood or lymph, becoming enlarged and transmitting coloured blood. The capillaries, and communicating vessels, and even the commencements of the veins themselves, are similarly dilated. The blood flows with increased velocity, which is caused by that part of the artery which is immediately contiguous, or leading to the inflamed and dilated portion, being morbidly excited.

The artery of an inflamed part, therefore, is at first smaller than during health, in consequence of the spasmodic action of the nerves, and the distension of the vasa vasorum, diminishing the calibre of the vessel; but it very soon becomes enlarged,

from the nerves being partially exhausted, and the vessel over-distended with blood; while the portion leading to the inflamed part is contracted in diameter; and if the inflammatory action has been of any continuance, the coats of the artery become inflamed; the tunica intima and arterial tissue studded with vasa vasorum, approach to ramollissement. The blood circulating in these inflamed capillaries, is of a deeper colour, and contains small irregular flocculi.

The swelling, modified according to the density and vascularity of the tissue affected, is first caused by the increased quantity of circulating blood, and secondly, by a deposition of coagulable lymph, and in some cases even by an effusion of serum and blood, which appear to occur very early in inflammation. In what is termed the phlegmonous inflammation, of which a common whitlow is a good example, there is generally more or less throbbing, which is produced by the pulsation of the inflamed arteries. To prove the change of structure, or nutritive action, which takes place in inflammation, we find that a part which has been inflamed, runs rapidly after death into putrefaction.

In severe inflammation, the nervous and circulating systems are involved, and constitute inflammatory fever. Sometimes the quickened pulse precedes the inflammation, while at other times it follows. In the former, the increased circulation, from whatever cause, so excites the nerves and arteries, that they are incapable of returning to their wonted quiescence; and the inflammation may be either partial or general, according as any part of the body is feebler than another. In the latter, the nervous system, together with the vascular, is excited by the diseased action being transmitted along the nerves to the brain and heart.

It is merely necessary to mention the humoral theories of Hippocrates, Galen, Boerhaave; the alchemical theory of Paracelsus; the spasmodic theory of Hoffman and Cullen; the excitability and excitement of Brown; the irritation, sensation, volition, and association of Darwin; the materia vitæ conservata, chordæ internunciæ, and materia vitæ diffusa of John Hunter; the debility of the capillaries followed by increased action of the larger vessels, or an inequality in the distribution of the

blood, according to Vacca Berlinghieri of Pisa, Drs Lubboch, Allen, W. Phillip, and Hastings; the increased action of the vessels in moderate degrees of inflammation, according to Drs Thomson, Parry, James, and Good.—The first and chief subject of dispute in these theories, is, whether obstruction to the circulation of the blood actually exists in inflammation. That this is the case in well-formed inflammation, there cannot be the least doubt; but in mild cases, such as erysipelas, it is not so very apparent. The more modern disputation is, whether there is increased action or debility of the capillaries: now we have shown, that the former precedes the latter, and that the transition is often very rapid from increased to debilitated action. In the increased state of the capillaries, the blood must necessarily flow with more velocity than in the debilitated condition of them.

Inflammation has been divided in a variety of ways, by Hunter, Kirkland, Pearson, C. Smith, Pinel, Bichat, Burns, Thomson, and James. From these authorities, a very simple arrangement may be formed; for inflammation, whether acute, sub-acute, chronic, phlegmonous, or erysipelatous, must be of the same nature, only differing in degree. Phlegmon and erysipelas are only varieties of inflammation, while the acute and chronic are merely stages of it. The adhesive, suppurative, ulcerative and gangrenous, are its terminations. Healthy inflammation comes under phlegmon; unhealthy, under phlegmon, erysipelas, and chronic inflammation; specific inflammation, which embraces scrophula, syphilis, cancer, and fungus hæmatodes, evidently involves two diseases in each of these peculiar constitutions; thus inflammation, occurring in either the scrophulous or syphilitic constitution, may be either phlegmonous or erysipelatous, acute or chronic.

Acute inflammation, whether phlegmonous or erysipelatous, is mild or violent according to a variety of circumstances. In a person of placid mind, with a healthy, temperate constitution, residing in a salubrious situation, it is natural to expect the attack will be mild, and more likely phlegmonous than erysipelatous; on the contrary, in a person of fretful, unhappy mind, under the influence of a diseased, debauched constitution, in a confined filthy abode, we have every reason to

expect the attack will be violent, and more probably erysipelatous than phlegmonous. We find, however, phlegmonous and erysipelatous inflammation occurring occasionally in both of these habits. Chronic frequently supervenes after the acute, as for instance in ophthalmia, and is also occasionally an idiopathic disease. Inflammation then may be divided into two varieties, the phlegmonous and the erysipelatous; into two stages, the acute and the chronic; and into several terminations, the adhesive, the suppurative, the ulcerative, the gangrenous, the schirrhous or carcinomatous, and all the varieties of the sarcomatous or accidental productions. The Greek *itis*, is now appended to the name of an organ to designate inflammation of it, as pleuritis, enteritis. It is ascertained, that according as the part affected is more or less vascular, the progress of the inflammation is more or less favourable. The phenomena of general inflammation are exemplified in acute, or chronic, whether phlegmonous or erysipelatous; and when these are confined within a small space they are said to be local, and when they extend to, or involve the nervous and circulating systems, the affection becomes general, and inflammatory fever is established.

Terminations of Inflammation.—When the vessels, by gradually becoming less active, resume their healthy state, it is named resolution; but there may be resolution also, though more slowly, when the inflammatory action has been so severe, that the capillary arteries have effused coagulable lymph or serum, and the absorbents have been excited to remove this superabundant deposit. In the case of the constitution being involved, or a general inflammatory action of the system, the nervous and circulating systems progressively decrease in their excitement, until they at last resume their natural course. Inflammation terminates also in the secretion of purulent matter, named suppuration; in destruction of the tissues, termed mortification; in the effusion of serum, styled dropsy; and in the various morbid degenerations of structure, as the sarcomata, melanosis, cyrrhosis, sclerosis. Absorption, considered by some authors a termination, is only a consequence of inflammation.

Phlegmonous Inflammation.—This variety of inflammation has often a diffused character, and includes Paronychia, Ophthalmia, Cynanche tonsillaris, Pleuritis, Pneumonia, Carditis, Peritonitis, Gastritis, Enteritis, Hepatitis, &c. The dark purple colour present in phlegmonous inflammation, formerly supposed to be dependent on a putrid tendency, or proneness to die from weakness, is now considered by some to be consequent "on obstruction of the respiratory function." This may be the cause in an asthmatic patient having phlegmonous inflammation of face, trunk or extremities, but surely not in those having healthy lungs, who receive a contusion of the upper or lower extremity.

Phlegmonous inflammation is said to have its seat in the cellular tissue; and this would seem to be correct, if we allow this texture to form the substratum of all the other structures of the body. This phlegmonous variety generally terminates in suppuration; sometimes, however, in resolution, but seldom or never in mortification.

Causes of Inflammation.—The causes of inflammation are very various, but they may be classed into vital, mechanical, and chemical. Fevers frequently give rise to it. Phlegmon has been produced by the irritation of extracting one of the bulbs of the hair. The alternations of temperature is a very common cause, particularly when there is distress of mind, arising from intemperance, producing biliousness and irregularity of the bowels. The operation of cold on the system, in inducing inflammation, has been long an interesting investigation. Intense cold applied for a short while to the surface of the body, paralyses or arrests the action of the extreme nerves for a time, and constringes the capillary blood-vessels, on which ensue a reaction of the contiguous nerves and arteries to overcome this torpidity and obstruction, and an effusion of the serous part of the blood between the cutis vera and cuticle. When this cold is long continued, both nerves and blood-vessels are so exhausted, the former rendered so torpid, and the latter so contracted, that they are often unable to recover their excitability; and in some instances, life itself is at once destroyed, and congelation of the fluids occurs. According, therefore, to the con-

tinuance of the cold, is the inflammation followed by recovery, or mortification of the frost-bitten part; on the same principle, does a moderate degree of cold produce simple inflammation. In this case, the nerves are merely chilled or impeded in their functions, the arteries constringed, and the re-action terminates in inflammation. Inflammation of the throat, chest, or belly, from wet feet, appears to depend, either on those parts being more delicate, sensitive, and vascular in their structure, *cæteris paribus*, than the rest of the body, or on their having suffered from a former attack; for it is well ascertained, that one attack predisposes to another;—erysipelas of the face is a familiar example. The effects of the cold, must be transmitted from the external surface to the internal organs, through the medium of the nerves, and thus threaten general fever; for it is more than probable, if inflammation of these organs did not take place, fever would ensue. This effect of cold takes place more readily, when there is any infirmity of the constitution.

Treatment of Inflammation.—The treatment of local inflammation depends much on the part affected; if in a finger, it requires less prompitude than in the eye. Generally speaking, local blood-letting, anodyne fomentations or poultices, rest, attention to the bowels, and abstemious diet, are all that is requisite; when a foreign body is present, its removal tends to subdue this action. The treatment of general inflammation is the local and general abstraction of blood, active purging, enemata, antimonial mixture, the warm bath, low diet, quietness, and confinement in a darkened apartment: when an important organ, as the stomach or liver, is affected, external irritants are also to be employed.

Local Blood-letting.—Leeches.—The manner of applying leeches is well known. They should be allowed to crawl on a cloth until their skins become dry, and if averse to bite, a little cream or blood ought to be applied, or the part pricked with a needle. They should be confined, as with a pill box, or wineglass, or held wrapped in calico. When few leeches can be procured, it has been proposed to cut

off the tail while the animal is sucking, that the blood may flow out as fast as it enters; or to incise the inflamed surface with a lancet or bistoury. In order to encourage the bleeding afterwards, the part should be fomented or poulticed, or a cupping glass applied. When the animal falls off, it should be immersed in porter for a few seconds, or in soft brown sugar, and afterwards put in clean water, which should be frequently changed for the first few days. Salt and stripping often kill them.

Leech bites are occasionally difficult to stem, particularly in children, and various means have been tried; the best of which is touching them with the nitrate of silver, then applying charpie or the felt of a hat, a linen compress and bandage. A finger pressing on the wound is sometimes the best; but when a blood-vessel is opened, it must be transfixed by a sewing needle, and a ligature twisted round in the figure of 8. I have seen the temporal artery wounded in children. The difficulty of arresting the bleeding, is to be ascribed to the triangular contused wound.

Leeches are preferable to cupping, in affections of the face, the forepart of the neck, the scrotum, the penis, the pudenda, and the anus, but in these parts, when the inflammation is diffused, punctures with the lancet are most serviceable.

Punctures with the Lancet.—When punctures are made, attention must be paid to the position of the part affected, for unless the return of the blood be in some degree impeded, no blood will flow. Thus, when the face is the seat of the inflammation, it should be held forwards and downwards; when the scrotum, it should be immersed in hot water, while the patient stands. The lancet should be held the reverse of that while opening a vein at the bend of the arm, and the point of the instrument plunged that degree of depth corresponding with the structure of the part and the proximity of blood-vessels, and always parallel with the subjacent muscles. It should be entered here and there, or at irregular distances. See Plate I. fig. 1.

Cupping.—Cupping is performed with a scarificator. See

Plate I. fig. 2. glass cup, fig. 3., and spirit lamp, fig. 4. or syringe. Some art is requisite in the performance of this little operation, for the scarificator must be promptly raised during the transition of the lancets from the one side to the other, to allow them to move freely round; and they should never be set to strike too deep, as they then completely divide the skin, and reach the cellular tissue, the blood-vessels of which are not so large and numerous, and when wounded pour their contents into the cells. Some improperly strike twice with the scarificator, crossing the wounds that were formerly made; others apply the cups before the scarificator, in order to determine the blood to the part.

When we perform cupping, we set the scarificator, which consists of a brass box of twelve lancets, six of which move on two rollers in opposite directions, by means of a lever, named also the handle or trigger *b*, and which trigger is to be pulled or moved from the one side to the other; we next apply the surface *a* to the skin, and press the bottom of the spring *c*, gently raising the instrument to allow the lancets to fly back, and thus inflict twelve wounds. Then a cup is to be applied, having the air rarefied by the spirit lamp, the torch of which should be carried to the bell glass top of the cup at once. Whenever the blood appears to flow slowly into the cup, it should be removed, emptied, and washed with warm water; so also the wounds; and then let the cup be re-applied. Seldom more than 8 or 10 ounces are obtained by one cup, therefore the operator must keep this in view according to the quantity he wishes to abstract, whether to apply more cups, and consequently to make more scarifications; spirit of wine alone, or combined with ether, is used to moisten the wick of the lamp. Various other cups have been invented by Messrs Weiss, Russell, and Macleod; but expert cuppers prefer the apparatus above described. A piece of dry lint is all that is required to be applied after this operation. Cupping may be performed by incising the skin with a bistoury, Plate I. fig. 5., or lancet, and then applying the cupping glasses. Cups are occasionally applied to leech bites, to abstract more blood. Local blood-letting may be compared to natural hemorrhage, as for example, bleeding at the

nose generally relieves congestion of the brain, and averts apoplexy; such bleedings, when admissible, always afford most relief. Leech bites, remaining open a considerable time, often let flow a great quantity of blood, as when applied to the scrotum, and when they inflame, act as a counter-irritant.

Cupping, though not a painful, is a most valuable remedy in many instances, being preferable to leeches in affections of the head, the spine, and joints.

Of the two modes of abstracting blood, general and local, the latter on all occasions is to be preferred to the former, as we obtain blood more directly from the diseased part, and in all complaints, even in fever, one organ is more affected than another; consequently general and local blood-letting ought very often to be combined.

Fomentations and Poultices.—Fomentations and poultices are more useful than cold saturnine lotions, in all instances of acute inflammation; heat being more natural and manageable than cold. Caloric subdues the action of the nervous and circulating systems by relaxation and exhaustion, and can be procured either in cold or hot weather; while cold does it by causing torpidity, but not until it be reduced to a very low temperature, and then it is liable to induce mortification. Many authors consider that hot and cold applications should be regulated by the feelings of the patient, but these ideas ought never to influence the practice of the surgeon; for the reason why cold at one time, and heat at another, is more agreeable to the feelings, depends entirely upon the time or stage of the inflammatory action. Thus, for example, cold applied during the incipient stage, will more readily induce pain, than when applied in the chronic; again, heat in the chronic stage is more apt to induce pain than in the acute; and whenever suppuration is established, or the inflammation becomes chronic, heat invariably increases the pain, and should be discontinued, cold then being the better remedy. When heat is employed, it must be kept constantly up by renewing the poultices and fomentations whenever they cool. Poultices are made of turnip, carrot, onions, linseed, barley meal, oat meal, bread and water, &c., but their virtues

depend more on the heat and moisture, than on the materials of which they are composed; the best probably is one made of bread, in a solution of opium with acetate of lead, ℥i of opium, ℥ij of acetate of lead, and 4 lbs. of water, or simply bread and water; they ought always to be so large as to cover a great extent of the contiguous healthy surface, as the arteries leading to the inflamed surface are excited. The best fomentation is a decoction of poppy heads and chamomile flowers, with a little opium added, ℥ij of poppy heads and chamomile flowers, with ℥i of opium in 4 lbs. of water. Poultices and fomentations will never promote suppuration; they only appear to do so by moderating the increased action, which, if not attended to, might terminate in mortification; when applied, therefore, in inflammation, before the vessels have advanced to suppuration, they will favour resolution; but if not until the vessels are on the verge of suppurating, they merely moderate the increased action, and hence appear to promote suppuration. The practice of applying alternately cold saturnine lotions the one day, and warm poultices the next, must seem absurd to any observer.

Counter-irritants are rubefacients, blisters, moxas, and setons. Rubefacients are designed to redden the skin, or in other words, to cause a determination to the surface, to remove the inflamed condition of those seated in the diseased organ. Various substances are employed, as camphorated oil, camphorated spirit of wine, ammoniated oil, oil of turpentine, tincture of cantharides, or a combination of them. The turpentine and cantharides are the most powerful. Another kind of rubefacients is warm and strengthening plasters. Blisters are made with potass, nitrate of silver, and cantharides plaster; the mode of applying the last is well known. When the potass or nitrate of silver is used, the skin must be moistened with tepid water, and then the pencil of nitrate of silver or potass rubbed once or twice, or oftener, over the surface, according to the severity of the desired effect. These two last, especially the nitrate of silver, is a great improvement, since it does not, like cantharides, excite febrile action or strangury.

Cauteries are divided into the potential and actual. The potential consists of the different escharotics and astringents, as the sulphates of alum and copper, and nitrates of silver and copper and potassa. The actual cautery is an iron heated to incandescence and the moxa. The irons used for cauterizing are of various shapes. See Plate I. figs. 6, 7, 8. The moxa is made of common cotton, immersed in a solution of the nitrate of potass, (of the strength of five grains to an ounce of water,) and afterwards dried. A small quantity of this cotton is firmly rolled up and encircled with a piece of card half an inch broad, and three inches long, and afterwards tied round with a thread. It is then fixed in a *port-feu*, (See Plate I. fig. 9.) the one end set fire to, and the other held firmly on the part to be chemosed. The common bellows are then employed to keep up the ignition of the cotton, until it be entirely consumed, thus resembling a common fuse. The ignition should be merely kept up, for the more slowly it burns, the more powerful is the effect. Potassa applied in the solid state, from three to six grains, and retained with a small compress of lint and a bandage, is fully more efficacious than the moxa. Blisters are made with aromatic vinegar, mustard, cantharides, boiling water, and the nitrate of silver. The latter is the best, and when required, the skin is to be merely damped with warm water, and then the crude nitrate pencilled over the surface twice or thrice. The cuticle rises in vesication in the course of half an hour, and there is no constitutional irritation, as in the application of cantharides.

Purgatives.—Active purging consists in giving four or five grains of calomel, with fifteen of jalap, aloes, or rhubarb, and in five or six hours, if the bowels are not moved, two or three ounces of the black draught, which consists of the infusion of senna with the sulphate of magnesia dissolved in it, in the proportion of ℥ss. of the former to ℥iv. of the latter. A mercurial purge in the beginning of fever or inflammation is very efficacious, as there is more or less derangement of the biliary system in this disease; but it should never be repeated. The saline are now beneficial, from being more cooling, and of these the combination of the sulphate of magnesia, with the tartrate of

antimony. Dissolve an ounce of the sulphate with a grain of the tartrate in two pounds of water, and of this solution or mixture give two or three ounces every three or four hours, as may be required, being careful not to excite vomiting.

Antimonials.—The antimonial mixture is the tartrate of antimony in a watery solution, one grain of the salt dissolved in one ounce of water, and of this a tea-spoonful or a dram given every three or four hours. When the bowels are easily irritated, this is better than the combination of the sulphate of magnesia. It is powerful in repressing or depressing inflammatory action.

Effervescents.—Effervescing draughts consist of the super-carbonate of soda and tartaric acid. Dissolve, in separate tumblers, one dram of the soda in five ounces of water, and a scruple of the acid in an ounce of water. Let the patient hold the tumbler with the dissolved acid, and the nurse pour the alkaline solution on it, and when effervescence begins, let him drink freely. In this way it is always palateable. This draught may be repeated every three hours. It acts as refrigerant and aperient.

Enemata.—The tobacco enema should consist of from five to ten grains, boiled in 2 lbs. of water for ten minutes, and then strained. It acts as a strong sedative and cathartic. Besides tobacco, we administer senna and salts, in the proportion of ʒss. of the former to ℥i. of the latter, boiled in a pint of water for ten minutes. The domestic enema, consisting of oat-meal gruel with an ounce of kitchen salt, and another of butter, is often very effective. Three or four drops of croton oil render either of these very powerful.

Warm Bath.—Warm bathing can seldom be employed, in consequence of the exertion of getting out of bed, and from there being often a local injury; but warm sponging, in bed, can be easily managed. Let a double blanket be put round the patient, the open mouth towards the nurse, who can then easily, with a sponge or piece of flannel moistened with

hot water, sponge the skin from head to foot. This can be repeated as often as there is morbid heat.

Low diet.—Low diet consists of vegetables and ripe succulent fruits, milk, and tea.

Inflammatory Fever.—It has already been mentioned, that phlegmonous inflammation often involves both the nervous and circulating systems, and is termed inflammatory fever, or synocha, or cauma.

Cold applied to the body while heated, will cause this fever, although no local affection be present. The cold checks the action of the extremes of the nerves distributed on the expansive surface of the skin, while it constringes, at the same time, the capillary blood-vessels, and shuts up the exhalent pores; the nerves thus excited, convey their impressions to the brain, spinal cord, encephalic, spinal, and ganglionic nerves, so as to throw into excitement the whole nervous system, while the occlusion of so extensive a series of vessels as the exhalents of the skin, will be to drive the blood from the expanded surface to the great cavities, as the cranial, thoracic, and abdominal, and thus excite the whole sanguiferous system. The exhalents themselves will be excited at the same time by the cutaneous nerves. When thus the nervous and sanguiferous systems are disturbed, they involve more or less every other system of organs and functions. A re-action will take place; the nervous system endeavours to overcome the impediment to the healthy function of its extreme and sentient parts, and the heart and arterial system struggle to relieve themselves, by forcing the constricted capillaries and exhalents.

Inflammatory fever is indicated by pains in the head, back, loins, or even over the whole body, particularly the knee-joints, prostration of strength, accompanied with hurried respiration, delirium, want of sleep, thirst, loss of appetite, nausea with occasional vomiting, scanty high-coloured urine, and constipation. The skin is red, hot, and dry, the face flushed, the eyes more or less suffused, the pulse full, strong, and quick, and the tongue furred. Some of these symptoms, es-

pecially the pulsations, will necessarily vary. The rigors, horripilatio, or shivering, is produced by the irritated nerves; the redness of the skin, by the re-action of the nervous and circulating systems exciting a slight degree of inflammation; the hurried respiration and pains over the whole body, by checking the cutaneous functions, and disturbing the actions of the deeper-seated organs; and that of the knee-joints, by their being so profusely supplied with nervous threads, thinly covered with integuments; the pain of the head, with occasional delirium, nausea, and sometimes vomiting, by the disturbed nervous system, and determination of blood to the brain; the pain in the back, from the same disturbance of the nervous system, and a greater determination of blood to the spinal cord. The fulness and quickness of the pulse, together with the suppression of the secretions and excretions, is the consequence of the cutaneous functions and the nervous and circulating systems being deranged. The prostration of strength is the necessary result of so great excitement. If the extremes of the nerves, the capillaries and exhalents, be not too much excited or inflamed, the re-action of the nervous and sanguiferous systems will overcome them, and produce perspiration; but if too much inflamed, and the exhalents occluded, no perspiration will ensue, and the fever will thus be aggravated.

Ague is an excellent illustration of this modus operandi, and even violent exertion in health exemplifies it; for the whole system may be so excited as to resemble violent inflammatory fever, but the moment perspiration takes place, the symptoms subside, and relief ensues. On the contrary, when there is no perspiration, these febrile symptoms are increased, the cerebral functions so excited, that violent delirium, convulsive twitches, and coma supervene.

This fever, accompanied with a local disorder, is commonly named sympathetic, or symptomatic inflammatory or irritative fever, and the cerebral excitement is usually so high as to deceive the patient in regard to the external injury. The term sympathetic or sympathy is inapplicable, and leads to erroneous views, and hence to wrong treatment. Thus in disease of the hip joint, pain is commonly felt at the knee; and Brodie, Bell,

and other writers, have attempted explanation upon various whimsical theories, whereas it is evidently consequent on and traceable to direct nervous communication. The same is the case with pain felt at the point of the penis in inflammation of the urinary bladder, with pain in the region of the spermatic cord and testis, consequent on calculus in the kidney, and that in the right foot, on stone in the bladder. For anastomosis of blood-vessels, participation in the same function, or the medium of sensation, will not account for these symptoms or sympathy. The different sympathies, or laws of sympathetic action, as the remote, the contiguous, the continuous, the universal, and the partial, commented on by authors, should, in my opinion, be exploded, and ought to be considered direct symptoms, characteristic of the disease.

The same may be said in regard to *irritation;* whether local or constitutional, it is and must be dependent on nervous connexion, and when long continued, generally produces excitement of the sanguiferous system. In the constitutional irritability, there are striking differences, and some depend on congenital formation, others on irregular living.

Treatment of Inflammatory Fever.—The treatment of inflammatory fever consists in local and general blood-letting, active purging, effervescing draughts, antimonial mixture, enemata, warm bath or sponging, low diet, rest, and the apartment kept darkened; which treatment is sometimes termed the antiphlogistic or depleting.

Blood is to be abstracted from the system by the lancet, which may be employed either to open a vein or artery, and the blood should be allowed to flow until fainting ensue, or a marked effect be produced on the constitution; a check must be given to the increased action of the nervous and circulating systems; for it is of no avail in an active disease such as this, to bleed without producing a decided effect on the system. Fainting or syncope takes place in general when 20 or 30 ounces of venous blood have been withdrawn. Whenever the constitution has rallied from the effects of the first bleeding, which generally happens in four or six hours, if the violent symptoms be not very materially subdued, a second bleeding

should be repeated, and carried also to syncope; but much depends on the age and constitution, and also the period of the fever at which blood-letting was first had recourse to, for it is a law in acute diseases, to modify venesection according to these; further bleeding may be even necessary, but the quantity required then to produce fainting will generally be very small. Syncope takes place more quickly in the erect than in the horizontal, but if the fever be severe, the patient will be unable to be raised even to the sitting posture.

Besides venesection from the general system, it is generally requisite to let blood locally; when the head, for instance, is much affected, leeches or cupping glasses ought to be applied to the temples or nape of the neck. When there is a local inflammation present, puncturing the surface with a lancet, or making incisions with the bistoury, will remove so great a quantity of blood as to act on the constitution, and supersede general blood-letting. Immediately after the first bleeding, a brisk cathartic of calomel and jalap should be given, and if this does not operate in five hours, a tobacco enema of 15 grains to the pint of water should be administered, and afterwards a dose of sulphate of magnesia. When the nausea of the cathartics has subsided, the patient should be immersed in a warm bath between 90° and 100° of Fahrenheit, and remain until nausea, syncope, or perspiration occur. Effervescent draughts may be given every two or three hours, with the antimonial mixture. Acidulated drinks may also be allowed, and low diet. If the local injury will not admit the patient to be removed into a warm bath, a vapour one, or sponging, may be used while he remains in bed.

In idiopathic inflammatory fever, when all increased action has been subdued, the diet should be gradually and carefully rendered more nutritious; but in the symptomatic, it may be generally increased more quickly, particularly if suppuration has commenced.

General Blood-letting.—Venesection acts upon the system by diminishing the sensibility of the heart, first by removing a portion of the stimulus to the brain, and secondly by lessening the quantity of the stimulus to the heart itself; the counten-

ance becomes pale, the patient feels nauseous and sick even to vomiting, his pulse becomes slower and softer even to disappearance, he makes long and deep inspirations, and faints or falls into syncope; but this does not always occur in proportion to the quantity taken away, for some faint from the loss of a very small portion, while others are able to bear the removal of a much larger quantity; and this difference seems to depend on the firmness or flabbiness of the fabric, and also on the state of the mind. In the lean frame, pressure seems to be kept up between the different structures of the system; while in the loose and flabby, pressure or support is deficient, in consequence of which, fainting takes place sooner than when the patient is of a firm habit of body; upon the same principle, a person faints sooner from being bled in the erect, than in the horizontal posture; the blood cannot be propelled so quickly and easily to the brain, which organ being deprived of its wonted support or pressure, and also of its stimulus, is unable to perform its functions, and fainting is the result; but apparently more from the want of support than stimulus, a fact corroborated by the phenomena in paracentesis abdominis for dropsy of that cavity, and also by leaping suddenly out of bed in the morning, or in raising a patient too quickly after fever, or long continuance in the horizontal posture; the mental condition is illustrated in mania, in hernia, in luxation, &c.

The heart contracts or palpitates more quickly by twelve beats in the erect than in the horizontal attitude, but this varies in different constitutions, particularly in the native of a cold climate, who has resided long in a tropical one. In feeble people it is greater, and in all after eating, drinking, or exercise.

Appearances of the Blood in disease.—In treatment much reliance is placed on the nature and colour of the blood, and many experiments have been performed to elucidate this interesting point. The spontaneous change of the blood, in passing from the liquid to the solid state, or its coagulation, has also been the object of experiment and investigation. The coagulum appears to form merely from the blood being allowed to remain

at rest; and happens in the living body whenever it flows out of its natural channel, or whenever that channel is so enlarged as not to be able to propel it with its accustomed rapidity and keep it fluid, as illustrated in aneurism, in varicose veins of the leg, and when an artery is secured either for aneurism or amputation. The nature and appearance of the coagulum or clot, vary very much; sometimes it is of a natural purple colour, at other times of a yellow or buff tinge; while at others it is of a milky hue. The buff-coloured blood, named also sizy and inflammatory crust, is occasionally turned up at its edges, presenting a concave surface, and is then termed cupped buffy blood, and not unfrequently presents an oleaginous appearance; this buffy colour is in consequence of the red particles falling to the bottom of the coagulum, and leaving the fibrin pure on its surface about a quarter of an inch thick. To convince us that these peculiarities of the coagulum of the blood, even the buffy coat, ought never to direct us in our diagnosis, or influence us in the slightest degree in our practice, we have only to refer to the experiments performed by Mr Vines, detailed in the 195th, 262d, and 234th Numbers of the Lancet. From these it is evident, that the conclusions hitherto drawn respecting the blood are incorrect. Many causes producing sudden death prevent the coagulation of the blood. During pregnancy the blood continues buffy from conception until parturition. In pneumonia, the blood, in proportion to the quantity lost, becomes more buffy; in many cases where only two cupfuls are taken, the last is occasionally more buffy than the first; and in some instances, when four or five, each cupful presents a different appearance; the first has a natural purple colour, the second a buff, the third cupped and buffy, while the fourth and fifth are again purple. The buffy appearance has been attributed to the magnitude of the orifice of the vein, but this is incorrect; the cupped appearance is certainly a better test of the existence of inflammation than the buff colour, but no weight should be given to either; the milky colour is generally present in diabetic, bilious, and dyspeptic habits.

In inflammatory fever, when the head is more affected than any other part of the body, the external jugular vein, the

temporal or the occipital artery, should be opened, as the relief is greater the nearer the blood-vessel is to the affected organ; again, as arterial blood affects the system more quickly and for a longer period than venous, the temporal or occipital artery ought to be preferred to the external jugular vein, as in general one half of the quantity of arterial compared with venous blood, affords relief.

Arteriotomy.—The operation of opening an artery is termed Arteriotomy, and is now almost exclusively confined to the temporal, in consequence of its being more easily reached, although the occipital, which was preferred by the ancients, would be the most beneficial, from its direct inosculation with the vertebral artery. In the days of Galen the arteries of the hand were frequently opened. In the Medico-Chir. Trans. of Edinburgh, vol. i., a case is mentioned, where the radial artery was opened by Mr Rhind, surgeon in India. When the temporal artery is to be opened, the patient should be in the horizontal position, with his head resting on a pillow; the operator then feeling the course of the trunk of the artery, as it runs over the zygoma, or one of its branches as it ascends along the temple, places the fore and middle fingers of his left hand on the vessel, the one above, the other below the point to be incised, in order to render it steady; while with his right hand he makes an oblique incision, about half an inch in length, through the integuments down to the artery, with a lancet, cutting as if it were a scalpel. When the artery is distinctly seen traversing this little wound, the surgeon is to make a similar oblique incision of the vessel, cutting it in a contrary direction, or pricking it from below upwards, as if he were opening a vein of the arm. See Plate II. Fig. 1. When the necessary quantity of blood has been taken, the lips of the wounds are to be approximated, a firm compress made of a roller of calico, about one inch in diameter, as delineated in Fig. 2. of Plate II. applied over it, and a double-headed roller to encircle the head, crossing as often as possible over the compress. See Fig. 3. of Plate II. The wound should be dressed on the third or fourth day, either with adhesive plaster, simple cerate, or lint wet with warm water and covered

with oiled silk, according to its appearance, and the compress and bandage re-applied. Afterwards it ought to be dressed daily, and the compress and bandage worn for at least a month, as aneurism is very liable to supervene to this little operation. When the artery does not heal, but ulcerates and bleeds from time to time, it requires to be cut across immediately below the wound, in order that the divided extremities of the vessel may retract into the contiguous cellular tissue, and thus be healed. Some divide the artery immediately after arteriotomy has been performed. Arteriotomy is preferred to phlebotomy, in apoplexy* and inflammation of the brain or eye, especially Iritis.

Phlebotomy.—The opening of a vein is termed Phlebotomy, from φλεψ and τεμνω, also venesection or bleeding. Venesection is commonly applied to blood-letting at the bend of the arm, although we sometimes select the external jugular, or one of the veins on the back of the hand, foot, or ankle. It has been done in the veins under the tongue, and on the forehead and face, but these are now abandoned. The external jugular is preferred in apoplexy and croup; but from the experiments of Sanders published in Seeds' Thesis, the abstraction of venous blood should do harm, as the blood is congested in the brain and spinal cord; the veins at the bend of the arm are chosen in general inflammatory diseases, and after accidents; those on the back of the hand, foot, and ankle, in very fat people, when a vein at the bend of the arm or external jugular can neither be seen nor felt. In many individuals, the veins at the bend of the arm can only be felt; and in such cases the surgeon should be experienced and most careful, as a nerve, the artery, or the tendon of the biceps, might be mistaken.

When the hand or foot is selected, it should be immersed in hot water, and retained there during the flow of the blood; a bandage is applied round the wrist or ankle, and one or more of the larger veins opened. When the foot is chosen, the an-

* Seeds de Sanguine misso.

terior tibial artery on the dorsum of the foot requires to be kept in view.

The manner of opening the external jugular vein, is to place the head of the patient on a pillow, while his body reclines horizontally; then to press with the thumb of the left hand on the vein after it has crossed the sterno-mastoid muscle, and when it becomes turgid, place the fore and middle fingers of the same hand above and below the point to be wounded, which should be over the muscle; next with the lancet in the right hand an incision is to be made obliquely across the integuments and fibres of the platysma myoides, from above downwards, using the lancet as a scalpel; and when the vein is distinctly seen, it is to be opened by cutting upwards. See Fig. 4. Plate II. In children and individuals with a fine soft skin, the vein may be incised at once, as that at the bend of the arm. Whenever the blood flows, the fore and middle fingers of the left hand are to be removed, but the thumb is to remain until the quantity required has been taken, and the wound closed with adhesive plaster, as air may enter, and prove fatal. No compress or bandage is to be used, for it would check the cutaneous venous circulation of the head. If, however, the plaster is inadequate to stem the bleeding, a finger must be applied and retained until the tendency cease.

When a vein at the bend of the arm is the vessel selected, the patient should stand, sit, or lie, according to the intended effect. If the intention of the surgeon is to produce fainting at the least expense of blood, as in rupture, the patient should be held erect, and a large orifice made in the vein, that the blood may flow quickly. In inflammation of the bowels, the object should be to abstract as much blood as cause syncope, but not hurriedly; the patient therefore should be sitting or horizontal, and a large wound of the vein made. During pregnancy we occasionally bleed, to relieve congestion, and have then to guard particularly against syncope or any uterine irritation; we therefore place the patient horizontally, and make a very small wound.

When a vein at the bend of the arm is to be opened, as represented in fig. 5. of Plate II., the patient must hold the arm extended, and have something to grasp in his hand,

to keep his fingers in motion, that the flow of blood may be promoted. A common walking-stick, which will give rest to the arm, and prevent any disturbance to the flow, is the best. The skin must be firmly stretched along the vein from below upwards, to prevent the wounds in the skin and vein from shifting; and this is generally done with a fillet or bandage, which should surround the arm twice, as close as possible to the point to be wounded, and be tied with a slipping knot on the outside of the arm. The bandage should be of that degree of tightness to interrupt the circulation in the vein, but not to intercept that of the artery, the pulsation of which ought to be felt at the wrist. The surgeon then places the fore and middle fingers of his left hand, as in arteriotomy, to keep the vessel steady; and with his right hand, holding the lancet somewhat like a writing-pen, and at an angle of 120° to the surface of the skin, he wounds or pricks the skin and outer wall of the vein at once, and gradually cuts obliquely upwards, making the wound in the skin somewhat larger than that of the vein, the latter being equal to the breadth of the vessel. The angle is formed by the upper edge of the lancet, and the surface of the skin, so that the operator sees this edge throughout; the lower edge of the lancet will necessarily make with the skin an angle of 60°. The blood should flow at the side of the lancet before it is withdrawn; and when the necessary quantity has been removed, the fillet should be unbound, and the vein compressed beneath or distad to the wound with the thumb of the left hand, the arm washed with tepid water, the lips of the wound neatly approximated, and a square compress of linen applied, and then bound up with a bandage rolled round the elbow joint in the figure of 8, as delineated in Plate II. fig. 6. The wound should not be dressed sooner than the third day, or probably it is perhaps better to allow the bandage and compress to become loose or fall off, and then treated according to appearances, either with a new compress and bandage, adhesive plaster, simple ointment, or lint wet with warm water, and oiled silk. It not unfrequently happens, that although the vein is compressed distad to the wound, the blood still flows, which arises from an inosculation with one of the deep-seated veins, in which case the thumb of the

left hand ought to be applied to the wound. A lancet, whether to perform arteriotomy or phlebotomy, should neither be too spear-pointed, nor too round or broad-shouldered. (See Plate I. fig. 10.)

In the performance of these operations, as in all others, every thing should be arranged before commencing. There ought to be a bandage, a compress, a walking-staff, a tumbler full of cold water, a basin with warm water, and a towel. If the patient faint before the necessary quantity of blood has been lost, he should be laid in the recumbent posture, and have a glass of cold water given him, or cold water sprinkled on his face. When a vein of the left arm is to be opened, the surgeon should use his left hand; therefore he ought to practise being ambidexter, not only for this operation, but to be adroit in some operations on the right eye.

However simple this elegant operation of venesection at the bend of the arm may appear, yet there are instances of life being lost even in skilful hands, in consequence of a high division of the brachial artery into the radial and ulnar, both of which sometimes run immediately between the skin and the fascia of the arm. A careless operator may transfix the vein, and wound the fascia of the biceps or the brachial artery, and thus venous and false aneurism may be produced, or extensive inflammation of the fascia of the arm, together with suppuration beneath it. Besides these diseases, there are ecchymosis, inflammation of the vein, of the skin, of the cellular tissue, of the lymphatics, and the wound of a nerve, which may all occur after venesection at the bend of the arm.

Affections consequent on Blood-letting.—Ecchymosis.—Ecchymosis, from εκχυω, is an effusion of the blood into the cellular tissue, contiguous to the wound in the vein, occasioned by the wound in the skin not corresponding with that in the vein, or the wound of the one not being kept in apposition to that of the other during the flow of the blood; or from the integuments overlapping the wound in the vein, the skin not having been braced with sufficient firmness by the bandage; or lastly, by not making the wound in the skin a trifle larger than that in the vein. When the blood forms

a circumscribed tumour, it is termed a thrombus, from θρομβος. The one, therefore, is a circumscribed tumour, and the other a diffusion of blood; each requires the same treatment, and unless the quantity of blood is great, it is of no consequence. If, however, the effusion is extensive, red, and painful, poultices should be applied, until all inflammatory tendency have subsided. The inflammation seldom or never ends in suppuration, even of the lips of the wound. If the ecchymosed fluid does not disappear, and the lips of the orifice are healed, but not otherwise, it may be discussed by compress and bandage, and stimulant embrocations, as camphorated spirit of wine, camphorated oil, ammoniated oil, tincture of soap with turpentine, camphorated mercurial ointment, a solution of the muriate of ammonia in water, mixed with alcohol, say ʒij of ammonia to Ibij of water, and ℥j of alcohol, or ʒij of the water of the acetate of ammonia to Ibij of water, and ℥j of alcohol. This last is the formula for the evaporating lotion of the Infirmary, and is the best application. If the blood is widely spread, and not absorbed in ten days, but remains liquid or coagulated, it should be evacuated by the bistoury, and never by trocar and canula; for unless removed, it will excite suppuration, and sloughing of the contiguous tissues. If an abscess supervene to a smaller effusion, it should also be freely opened. Ecchymosis comes to be treated of again under injuries of the head, fractures of the bones, and other accidents. All surgical operations are followed by ecchymosis more or less, just as the parts may have been torn or bruised; but it even supervenes to operations scientifically performed, especially in the face and other delicate parts of the body, because the knife cuts on the principle of a saw. Ecchymosis, too little understood, forms an important question in medical jurisprudence, and I have heard more than one of the sage professors of our University deliver erroneous opinions on this point, which evidence, uncontradicted, would have proved fatal to the accused.—See Ryan's Medical and Surgical Journal 1835, and Report of cases before the High Court of Justiciary for 1836.

In cadaverous lividity, or livor, or sugillation, there is no infiltration of blood in the cellular tissue, and hence it ought

never to be confounded with ecchymosis. The same may be said in regard to lividity consequent on gangrene. Let the student examine carefully the cadavera in the morgue of an hospital and dissecting-room, and he will not commit such puerile blunders.

Another affection supervening to blood-letting, is a slight inflammation round the wound, terminating in a small abscess, which neglected, or improperly treated, spreads over the whole arm. The inflamed surface should have several punctures made with the lancet, or a number of leeches applied, and afterwards anodyne fomentations and poultices. If an abscess form, let it be freely incised.

Too often, in phlebotomy, from an over-anxiety to heal the wound, it is dressed the day following the operation; the consequence is, that the process of adhesion is disturbed, and too great a degree of inflammation is excited, which spreads all over the arm, assuming either the erythematous or erysipelatous type, or involving the subjacent cellular tissue forms erysipelas phlegmonodes, or extending to the fascia of the arm, or affecting the lymphatics, and even the vein itself.

Erysipelas and its varieties.—I have already mentioned the most common cause of inflammation supervening to venesection at the bend of the arm, which may also arise from the same causes with those of inflammation of the vein; and I have already stated, that the variety of inflammation which generally occurs upon this occasion is erysipelas. This variety then, or type of inflammation, for it appears nothing else, has been divided by authors into a number of species, as may be seen by consulting the works of Cullen, Bateman, Pearson, Smith, Pinel, Alibert, and James; for it attacks the same structure as the phlegmonous; thus the velum pendulum palati is as often affected with erysipelatous as with phelgmonous inflammation; the former named cynanche maligna, the latter cynanche tonsillaris.—I shall confine myself to erythema, erysipelas, and erysipelas phlegmonodes.

Erythema, from ερυθρος, is that species wherein the inflammatory action is confined to the surface of the cutis vera or

chorion, and either supervenes to a wound or surgical operation, or occurs idiopathically. In some instances, it is ushered in by considerable constitutional irritation or fever, while in others it progressively spreads from the wound, and ultimately induces fever. The skin has a delicate rosy blush, is rather dry than moist, is slightly tumefied, and hot and painful; when pressed gently with the finger, a white mark remains for a little. It is also very apt to spread from one place to another, in this manner extending all over the body, from the head down the back and breast to the arms and even the legs, the one part desquamating as the other makes its appearance. It is likewise subject to be translated from one part of the body to another, like rheumatism, from the leg to the lungs or face, and it has been known to occur periodically. The treatment consists in making numerous small punctures with the lancet, as depicted in Plate I. fig. 1, in employing an anodyne fomentation or poultice, the internal exhibition of the tartrate of antimony, with or without the sulphate of magnesia, the effervescent draughts, acidulated drinks, low diet, quietness, and the chamber kept dark. After the violence has been subdued, the part may be rubbed over with the nitrate of silver, or dusted with calcined magnesia; the magnesia is preferable to flour or hair powder, a common but very inert application. When the nitrate is used, the skin should be rendered slightly damp before its application. Nitrate of silver is often applied in the commencement of this variety, as well as in erysipelas, but is objectionable in consequence of obscuring what may be going on, for in many cases suppuration, and even sloughing of the tissues, take place beneath. The nitrate is also applied, and with great advantage, in both of these varieties, on the sound skin, immediately above or around the affected part, to arrest the extension of the disease. It must be rubbed on, therefore, several times at once, to produce chemosis and suppuration of the sound part.

Erysipelas, from ερυω and πελας, termed in common language *rose*, or St Anthony's fire, is that species wherein the whole chorion is involved; and occurring after blood-

letting at the bend of the arm, it begins in the contiguity of the wound, and soon spreads both upwards and downwards, frequently involving the whole arm, which becomes swollen; the skin assumes a delicate rosy tinge, and is clear and shining; and when pressed gently with the finger, a white mark remains a little longer than that in phlegmonous inflammation. A yellowish hue is frequently observable, and there are occasionally serous vesicles, which either dry up, or burst and desquamate, or ulcerate, or slough and ulcerate. The patient feels a hot burning pain in the part; and when the constitution becomes affected, which is early in the disease, there is inflammatory fever with considerable nausea. By some it is asserted, that the wound of the vein often heals and continues so, while on other occasions it breaks out before the erysipelatous affection takes place.

The treatment consists in making incisions from half an inch to one inch in length, at irregular distances, and parallel to the subjacent muscles, which incisions, by the local abstraction of blood, moderate the inflammation, relieve the tension, and give exit to any serous or sero-purulent fluid which may be effused; then follow anodyne fomentations, a mercurial purge, antimonial mixture with sulphate of magnesia, low diet and rest. Incisions are preferable to punctures, as there is always serous and even sero-purulent fluid effused, and if not treated thus actively, erysipelas phlegmonodes is to be apprehended. When scarifications are made with the bistoury, the wounds should be plugged with small slips of lint, if they continue to bleed after a requisite quantity of blood has been abstracted; but the raising the arm has a great tendency to arrest the bleeding. Nitrate of silver should be applied to the sound skin, as recommended in erythema. If the disease is not modified or rendered milder by this treatment, if too much blood has been abstracted, or typhoid symptoms threaten, small doses of sherry wine or gin should be administered. In the debauched constitution these stimuli must be given *a priori*, to prevent delirium tremens.

When erysipelas attacks the face or scalp, it ought to be treated with great promptitude, on account of its vicinity to the brain; and when once either of these parts have

been attacked, it is peculiarly liable to return on the slightest exposure to cold. Punctures with the lancet bleed more freely than leech bites, and do not leave a mark. In making these punctures, they should run parallel to the subjacent muscles, and the head must be somewhat dependent to produce temporary venous congestion. It should hang over the bed. The eyelids, when affected, always suppurate and slough, and hence the necessity of punctures, if not incisions. The integuments of the head are particularly prone to erysipelas after all wounds, especially punctured ones; it also often occurs after compound fractures of the leg, and occasionally in the anasarcous leg. It not unfrequently attacks the umbilical region of new-born children, and extends along the umbilical vein, or downwards to the pudenda. This species is subject to the same laws as erythema.

In this disease, a vein, if opened in the opposite arm, never assumes the erysipelatous type; nor do leech-bites, according to the common opinion, mortify; a blistered surface never becomes erysipelatous, but, on the contrary, limits it. Emetics are pernicious remedies, particularly when the head is the seat of the disease, because they propel the blood to that organ. The epidermis, the rete mucosum, the cutis vera, the cellular tissue, and the cellular substance forming the aponeurosis of the muscles, have all individually and collectively been supposed by authors to be the seat of erysipelas.

We find erysipelas attacks mucous structures, as the mucous membrane of the fauces; the serous, namely the pleura and peritoneum; the synovial, especially the sheaths of the tendons; also fibrous textures, as the periosteum; and I can see no reason for the exemption of any other tissue.

Erysipelas Phlegmonodes.—Erysipelas is described as being confined to the skin, and that when the subcutaneous cellular tissue is involved, it is termed phlegmonous erysipelas, erysipelas phlegmonodes, or diffuse inflammation of the cellular texture.

Erysipelas phlegmonodes is distinguished from simple erysipelas, by the part affected presenting a combination of the two

colours, the vermilion and purple, and often a yellow tinge, and by the œdematous boggy feeling. An œdematous spongy sensation is one of the best criteria of suppuration having taken place. In some cases there is no redness of the skin, on the contrary, rather a pallidness, resembling phlegmasia dolens, particularly when it attacks the tissues in the vicinity of the wrist-joint. In some cases this disease begins locally, for example, in the lower third of the leg, and seems at first quite superficial, apparently extending no deeper than the subcutaneous cellular tissue, for on making the ordinary free incisions, the affection seems to be arrested; a few days however scarcely elapse, when abscesses form between the muscles, and even the synovial sheaths of the tendons, and the synovial membranes of the articulations, inflame and suppurate, so destroying the limb as to demand its removal. In other instances, the inflammation at the commencement also superficial, proceeds deeper and deeper daily, and destroys the periosteum and synovial membranes of the joints and the tendons of the muscles, extending from the fingers to the shoulder-joint, or from the toes to the hip-joint; the consequent constitutional excitement or inflammatory fever prevents amputation. In others again, an irritative fever is present from the beginning to the termination, as if it were purely idiopathic, the course of the disease being very rapid, in defiance of all means.

Whenever this disease can be distinguished, free incisions should be made; and these require to be numerous, as the matter is often diffused over a great surface. These incisions not only relieve the tension, but moderate the inflammation, and give exit to the serous or sero-purulent fluid. Punctures by the lancet, however early, seldom prove sufficient. Instead of short, or moderately sized incisions, from two or three inches in length, as first recommended by Mr C. Hutchison, and delineated in Plate II. fig. 7, Mr Lawrence makes a long incision, even the length of the limb, which is evidently objectionable. In dissection of the more severe cases of erysipelas phlegmonodes, the subcutaneous cellular tissue, even that forming the basis of the muscles, the synovial membranes, and the periosteum, are in a sloughing condition. There appears no ground for considering erysipelas infectious, and it is even doubtful how

far it is contagious; nevertheless, in this as in all other diseases, every attention should be paid to cleanliness and ventilation.

Inflammation of a Vein.—Inflammation of the vein, named Phlebitis, is caused frequently by cold, and is said to arise also from foul lancets, which, however, appears to be very seldom the case; a vein however ought never to be opened by a lancet which has been employed in opening a syphilitic bubo, or in performing vaccination. When a patient requires to be bled twice in the course of twenty-four hours, a common practice is to abstract the second quantity of blood from the same orifice, by applying another bandage round the arm above the wound, until the veins become swollen, then removing the first bandage, and tearing away the compress adhering to the wound, when the blood commonly springs out; but if not, the wound is forcibly opened either with the fingers, or by squeezing the blood along the vein onwards to the orifice, or by inserting a probe or lancet; such teazing steps are even taken in a third bleeding, if performed within twenty-four hours. If there is not much inflammatory action present, and the second bleeding is performed within twelve hours of the first, this plan may be adopted; but otherwise, it is extremely liable to produce inflammation, since the adhesive process takes place very quickly between the lips of a vein and so small a wound. It is therefore preferable, in all cases, to open a vein of the opposite arm. The same vein is sometimes opened close to the first wound in the course of twenty-four hours, which is also an improper practice; neither this, nor opening the same wound twice, should be adopted in hospital practice, particularly in thoracic inflammation, since the veins are more liable to be inflamed when lanced in this, than in any other disease.

Inflammation of the vein is characterized by tumefaction of the arm, occasional redness in the course of the vein, pain in the wound darting to the axilla, and even to the thorax, accompanied with difficult respiration, an oppressive sickening feeling, great anxiety, countenance indicative of great suffering, and inflammatory fever, which rapidly degenerates into typhus; this is often named irritative fever. Typhus frequently supervenes to inflammatory fever in surgical diseases,

and is characterized by the pulse becoming small, weak, and rapid, from 100 to 140, the skin hot and dry, the tongue brown and coated, as also the teeth, the eye glazed and moist with mucus, adhering to the eye-lashes, great prostration of strength, low muttering delirium, scanty high-coloured urine, and constipation of bowels. The vein feels hard, is very tender when pressed, and sometimes inflamed both upwards and downwards even to the back of the hand; the lips of the wound are everted, swollen, and occasionally pus or saniés mixed with blood can be pressed out. Not unfrequently there is an œdematous boggy feeling in some parts of the arm, with more or less inflammatory discoloration of the integuments.

The constitutional symptoms, named by some authors the secondary affection in phlebitis, supervene to the wound within from 2 to 12 days, and with extreme rapidity often lead to a fatal event. Some have died on the sixth day, without any secondary local affection having been developed. The same constitutional symptoms have followed the division or excision of the saphena vein, the securing this vein with a ligature, amputation with or without the securing of the veins, and puncture of the femoral vein. Veins traversing an inflamed organ, or even in their contiguity, have been occasionally found inflamed, and also from long continued distension in protracted accouchement; and phlebitis is now considered a cause of puerperal fever, and of phlegmasia dolens.

On dissection, the vein is found so thickened in its coats from the deposition of lymph, that it has all the appearance of a nerve; and blood, coagulable lymph, and pus, are deposited in its cavity, to the extent of plugging it up. The lymph sometimes agglutinates the internal membrane, while on other occasions an irregular false membrane is secreted by it; the internal coat is of a reddish purple colour, resembling claret. The inflamed appearance generally ceases when a conspicuous vein joins the diseased one, or where the diseased vein merges into another. Pus is occasionally collected between the tunics, at other times in the cellular tissue around the vein, forming small abscesses onwards to the axilla. There is more or less of purulent matter in the contiguous

cellular tissue, and even in that entering into the formation of the muscles; and in some instances the two pectoral and the contiguous intercostal muscles are infiltrated with pus. The pleura is often found inflamed, with abscesses forming in the lungs; and sometimes the right auricle and ventricle will also be inflamed even with pus in the inter-muscular tissue of the heart, and in the pulmonary artery. In many instances, the arachnoid membrane has been found thickened and opaque, with serum in the texture of the pia mater, and in the ventricles of the brain. The pleura is often found inflamed and coated with lymph, and also sero-purulent fluid in its sacs; while the lungs contain collections of pus forming distinct abscesses. The pericardium and serous membrane of the heart have been affected in a similar manner, and pus found in the inter-muscular tissue of the heart and pulmonary artery, with patches of inflammation in the right ventricle and auricle. The arachnoid membrane has been found thickened and opaque, with serous effusion in the texture of the pia mater and in the ventricles of the brain. The eye has been deranged in structure, in its tunics, and humours. The opposite arm, or thigh, or knee-joints, have contained purulent matter. The same peculiar purulent depositions are formed after amputation, external injuries, punctured wounds of the fingers in dissection, &c.

Inflammation of a vein is very dangerous, because the veins circulate their contents onwards to the heart, and convey the inflammatory action to this viscus with alarming celerity. The coagulable lymph and purulent matter effused into the veins, must also be carried in some cases onwards to the heart; besides, the venous system is so important in the animal economy, that inflammation here must excite violent fever, with rapid exhaustion. From these consequences, it is evident that the treatment of this disease must be very prompt. The patient should be bled to syncope, by opening a vein of the neck or opposite arm. Calomel and opium given after the blood-letting is highly beneficial; two grains of calomel with an eighth of a grain of opium every two or three hours, until slight affection of the mouth take place. Together with blood-letting, should be

combined tobacco enemata, brisk cathartics, warm bath or sponging, leeches in great number to the part affected, or scarifications with the bistoury, represented in Plate II. fig. 6.7 making the incisions on each side of the vein and parallel to it, guarding against wounding either it, or the accompanying nerves or artery, followed by large anodyne poultices, or fomentations, with low diet and quietness.

From the quantity of blood that can be abstracted by this local means, it should be had recourse to in preference to the general blood-letting. If these local applications do not seem to arrest the extension of the disease, large blisters should be applied; when pus can be discovered even within the calibre of the vein, it must be freely evacuated with the bistoury. The general treatment in all these affections is the same with that recommended for inflammatory fever; pressure on the vein both above and below the wound has been recommended, but I should rather consider this would increase the inflammation. The division of the vein has been also proposed; as likewise enlarging the wound with a probe-pointed bistoury, all which are objectionable from the irritation they excite. When the case becomes chronic, gentle bandaging, combined with camphorated spirit of wine, or camphorated mercurial ointment, or the tincture of iodine, will be found advantageous; this latter remedy possesses marked powers of exciting absorption.

Inflammation of the Lymphatics.—Inflammation of the lymphatics, termed lymphangitis, lymphitis, and angeioleucitis, begins by the wound appearing fretful, inflamed, and suppurative, by a cord or cords being felt sometimes above, and at other times below, the wound, but not precisely in the course of the vein. These cords, which are occasionally mere streaks or lines, appear of a delicate rosy red colour, are exceedingly tender to the touch, and have frequently one or more tumefied points on the inner or ulnar margin of the biceps muscle, in the course of the brachial vessels; similar red streaks and tumours are also often seen on the fore arm, between the elbow and the wrist joints. The glands of the axilla soon become affected, with acute pain in the wound, in these lines and tumours, and general tumefaction of the

arm, accompanied with considerable symptomatic fever. Either before or after the inflammation of the lymphatics, the contiguous cellular substance is speedily involved, frequently with extensive suppuration of both; which also spreads to the axillary glands, in which case there is more or less œdematous feeling. According to the extent of the evil, the treatment requires to be either entirely local, or both local and general. Commonly warm anodyne fomentations, a mercurial cathartic, effervescing draughts, antimonial mixture, low diet, and rest, subdue this affection; but if there be any tendency to sero-purulent infiltration, we must keep in view incisions. Any small abscess which may supervene, must be freely incised, especially a bubo in the axilla.

Inflammation of the Fascia.—Inflammation of the fascia of the arm commonly takes place, when the operator has transfixed the vein and wounded this membrane; but this accident may occur in the most skilful hands, for occasionally the most prominent vein at the bend of the arm, and the one any surgeon would select, runs beneath the fascia of the biceps. The symptoms of this affection are acute pain in the arm, extending to the shoulder, whenever the fore-arm is moved, which latter is in some degree bent on the arm, with the fingers also bent and contracted; there is great tension, some degree of tumefaction, in consequence of anasarca, and slight erysipelatous inflammation; there may also be sympathetic spasms over the whole body.

As suppuration quickly supervenes, with thickening of the fascia, and contraction of the elbow joint and fingers, the treatment should be prompt; indeed, this affection being erysipelas phlegmonodes, consequently the same means should be used as for that disease: and in the event of contraction, the fascia of the fore-arm must be divided either at its connection with the biceps muscle, or what is preferable, immediately below or distad on the pronator and flexor muscles, avoiding the course of the veins and nerves, and even the ulnar artery in case of a high division of the brachial. When there is great tension during the inflammatory stage, accompanied with severe pain, the fascia even then should be divided.

Wounded Nerve.—A nerve at the bend of the arm is very liable to be wounded in venesection, in consequence of the twigs of the internal and external cutaneous nerves, and even some of the spiral nerve, entwining the different veins. When a nerve is wounded, the patient feels acute pain the moment the lancet pierces the vein; and if inflammation of the wound follows, the nervous symptoms immediately commence, and acute pains are experienced, darting along the arm to the fingers. When inflammation of the wound does not take place, it heals up, and some days, even weeks, elapse before the nervous symptoms begin; and in this case, which is the more common of the two, there are convulsive twitchings, with restless nights and frightful dreams, sometimes resembling tetanus more than the other. On some occasions the appearance of neuralgia is assumed.

The treatment of this affection generally yields to the application of the nitrate of silver or potass to the wound, after all acute inflammation has been subdued by bread and water poultice, or anodyne fomentations. If tetanic symptoms should supervene, which is now considered very rare, then the treatment would require to be very active, and for which the reader is referred to Tetanus. The nitrate of silver is rubbed over the wound several times, and the potassa only twice or thrice, to destroy the nervous sensibility; oiled lint is then applied, and lastly the bread and water poultice.

ADHESION.*

Adhesion is that termination of inflammation which takes place when the inflammatory action is moderate, and coagulable lymph only is secreted; in common phlegmon, this occurs very soon after the increased action has begun; the lymph effused into the contiguous cellular tissue, limits the extension of the inflammation. It takes place also in all acute abscesses, and in all incised wounds, whether acci-

* Adhesion has been inadvertently left out in the enumeration of the terminations of inflammation at page 13.

dentally or intentionally inflicted. Adhesive inflammation, or union by the first intention, although a termination of inflammatory action, begins a new series of operations, and its doctrine, being one of the most interesting and important in surgery, has engaged the pen of our most able pathologists. When a clean incised wound is made, such as that in amputation of a limb, and the sides of such a gap are made to approximate, the first process in nature to effect a reunion, is a moderate degree of inflammation, by which coagulable lymph is effused, which appears to be effected by a modification of the capillary arteries, influenced by the nerves, to secrete this organizable fluid. That coagulable lymph is a secretion, appears evident from the fact, that in slight degrees of inflammation of serous membranes, it is unquestionably secreted, and in abscesses and ulcers it is poured out copiously; that in fractured bone it is a pure secretion; that in incised wounds, the blood acts as a foreign body, and that every fluid, either healthy or diseased, is secreted, or undergoes modification in vessels; it is also one of the simplest of diseased secretions. The bleeding of a wound must have ceased before coagulating lymph can be effused; hence it appears that some modification of the bleeding or capillary arteries, influenced by the nerves, takes place. This coagulating lymph differs from that obtained when recent blood is allowed to coagulate, being of a lighter colour, nearly transparent, like animal jelly or made starch, and being more tenacious, also more organizable.

The common doctrine of this lymph either issuing from the half-closed mouths of the vessels, or from the surface of the opened cells of the cellular substance, seems incorrect. After this coagulating lymph is effused, the capillary arteries and veins of each side of the wound shoot into it, soon rendering it a firm bond of union; and an inosculation has been proved to take place in the short space of twenty-four hours. In inflammation of the serous membranes, the pleura, pericardium, peritoneum, internal tunics of arteries, &c. the degree of the inflammatory action is often exceedingly mild, and the duration very short which accomplishes adhesion; apparently almost as soon as inflammation is established, the serous secre-

tion is checked, and that of coagulable lymph substituted. On the principle of this adhesive inflammation, are the various incised wounds healed, also the renovation of a nose, or under lip, or a deficiency of the urethra.

SUPPURATION.

Suppuration is another termination of inflammation. Whenever the inflammatory action is more violent than what is necessary for the capillary arteries to secrete coagulable lymph, these capillaries, modified and influenced by the nerves, form small suppurative papillæ that secrete purulent matter, which theory of action constitutes that of suppuration. When this arises from acute inflammation, and the matter is circumscribed or confined in a sac, the disease is named acute abscess; for we have purulent matter, or a puriform fluid secreted by inflamed mucous membranes, which are the most subject to this termination. It is also secreted in serous membranes and incised wounds, and in the skin or cutis vera after a scald with boiling water or the application of a blister. In mucous membranes, such as the urethra, the capillaries are naturally endowed with the power of secreting a mucous fluid; and these vessels inflamed, are easily and quickly modified by the nerves, to secrete a puriform fluid, as for example, in Gonorrhœa occasionally twelve hours after infection. In this case the capillaries do not seem to form suppurative papillæ as in common suppuration and ulceration. In the cutis the capillaries perform the functions of exhalents naturally, so that when stimulated by a blister, they are soon modified by the nerves to perform the function of secreting purulent matter; and if the irritation be kept up by blistering ointment, they soon form suppurative papillæ. In incised wounds, the capillaries perform the same office as in ordinary suppuration; small suppurative papillæ being rapidly formed, and then pus secreted. I have seen pus secreted in eleven hours after amputation. In all cases of suppuration there must be a precedence of inflammation, however slight in degree, even in scrophulous tumours or abscesses.

In the experiments performed by Drs Hastings and Gendrin, it was observed in the part subjected to irritation, that at a late period of the experiment, when the circulation became retarded or sluggish, a new series of phenomena presented themselves; serous or purulent fluids made their appearance in the part congested, and at the same time the tissues became softened. All loose tissues, as the cellular, when attacked with inflammation, are more prone to terminate in suppuration than condensed compact structures, because the blood-vessels have greater latitude to form suppurative or ulcerative papillæ. Some authors have named the suppuration of mucous membranes, superficial suppuration, and that in the cellular tissue, interstitial.

The symptoms of suppuration are rigors or cold shiverings, which occur at irregular intervals, and if the inflammation has been extensive, are commonly followed by a hot fit and slight increase of the preceding febrile symptoms, a total subsidence of the pain of the inflammation for a time, which is soon resumed if the hot applications are continued, especially if the suppuration is superficial. In a short while the pain returns, but changed to a dull, heavy, and constant uneasiness; the tumour becomes conical, or as it is termed, points, with a white or yellow tinge at the apex, while the surrounding inflammatory colour is deeper and the skin more glistening; there is occasionally more or less of an œdematous feeling, and matter is then distinguishable to the fingers, a state named fluctuation.

Considerable practice is required to distinguish matter from blood, from superabundant adipose tissue, from fungoid tumor, &c., and the excelling in this is named *tactus eruditus*, a valuable acquisition to a surgeon, for an aneurism has been mistaken for an abscess. The fore and middle fingers of both hands should be applied to the skin over the abscess, and the fluid or pus made to undulate between them, or from the one hand to the other, so as to give an impulse to each. One of the best examples of an acute abscess, is the termination of an inflamed inguinal gland in suppuration. Whenever the fluctuation of matter is perceptible in a circumscribed acute abscess, a free incision should be made with the bistoury, from the one end of the tumour to the other, or still

better, a crucial incision; but in an extensive or diffused abscess, the most depending part should be selected for aperture.

Unless a free incision is made in the circumscribed abscess, the matter is liable to loiter at one of the extremes, and form a sinus or sinuous ulcer or tube, which afterwards requires to be laid open,—an event frequently exemplified in abscesses of the axilla, and the syphilitic abscess in the groin. Some authors recommend that abscesses should be allowed to break of themselves, in which case, when the tumour points, absorption of the integuments proceeds further and further, until a small aperture ultimately forms, and the matter escapes; while others recommend caustic instead of the bistoury; but the knife is preferable, as it inflicts less and more transient pain, makes an aperture proportioned to the abscess, and prevents the disease making further progress. When the abscess is deeply seated, absorption even of the thinnest portion of its sac would require months before it could rupture, and give exit to the pus, while the pressure of this fluid would be all the while exciting absorption of the contiguous important tissues. A gland in the groin, before incising, should be allowed to have thoroughly suppurated, otherwise it presents a projecting fungoid appearance requiring the application of the potass. After the evacuation of the matter, poultices should be applied for a day or two, when the wound ought to be dressed with simple dressings, as lint wet with warm water, and oiled silk over it, or lint thinly covered with cerate, a compress of tow, and a calico roller; and in the case of the groin being the seat of the disease, the bandage should encircle the body and the thigh in the figure of the digit 8. The times of dressing an abscess must depend on the quantity of matter secreted; commonly once in twenty-four hours is sufficient.

In those cases of acute abscess of the palm of the hand, fore-arm, arm, thigh or leg, where the matter is situated beneath the fascia, there is generally a dull cutaneous inflammatory discoloration, and an œdematous feeling, which, with the other symptoms already enumerated, indicates the presence of matter. In such cases the fascia must be freely divided with the bistoury, avoiding the larger arteries, and the earlier the

matter is evacuated the better. Various whimsical instruments are employed to open abscesses, but the simple straight bistoury in common use is the best. See Plate I. fig. 5. When potass is applied to open an abscess, it may be either rubbed on the prominent point several times, or from three to five grains, kept on with lint and bandage. An œdematous boggy sensation is the index of matter being secreted, yet it is often exceedingly difficult to distinguish its presence. An acute abscess is coated with coagulable lymph of a smooth membranous-looking ash colour, which is termed the sac or cyst, and adheres by a vascular cushion to the surrounding cellular substance, the latter of which, in the vicinity of the abscess, is more dense and vascular, and its cells are closed with coagulable lymph. In this vascular cushion and stratum of coagulable lymph, the capillary vessels modified to secrete the purulent matter are situated, together with the nerves, veins, and absorbents. In all abscesses, a secreting and absorbing action goes on. A remarkable circumstance is, that an abscess advances almost always to the surface of the body, which has been attempted to be explained on the principle of plants growing towards the light; but it were better ascribed to the skin offering less resistance, for matter deposited beneath a fascia burrows in all directions.

The matter of an acute abscess, in a healthy constitution, is named pus, or purulent matter, and is of a yellow cream colour, and about the consistence of rich cream. Pus slightly irritates the contiguous skin of an abscess or ulcer, and even the granulations; therefore, it ought to be absorbed by lint and tow as soon as possible.

Sinus.—When an abscess is neglected, the matter frequently forms a long tubular secreting surface, named a sinus, or sinuous ulcer. These are very common in the groins and axillæ, also in the region of the anus and perineum, being in the two latter named fistulæ. Whenever they are short, and it is practicable to lay them open, it should be done by inserting a probe-pointed bistoury either straight, fig. 8, or curved, fig. 7, in Plate III., so as to expose them, or convert them from the tubular to a flat surface, or from a hidden to an

exposed ulcer. If any small vessels bleed much, the wound must be plugged with lint in short narrow stripes. It should be poulticed until the lint come away or be removed; which should be done when it has become loose, or when suppuration takes place, which is commonly on the 3d or 4th day; and afterwards it should be treated as a simple or indolent ulcer, according to the appearance of the surface.

To lay sinuses open, when they are long, would expose an extensive surface, and excite too much inflammatory action; a seton is therefore inserted, to induce moderate excitement, and thus change the callous tube into a vigorous granulating surface, and heal it up. The seton should be nearly so thick as to fill the sinus, unless the latter is very wide, and should remain at least three weeks, when it may be either withdrawn, or merely reduced in thickness.

ULCERS.

Simple Ulcer.—An abscess, when freely opened, and dressed daily, gradually fills up by the formation of suppurative papillæ or granulations, and when these arrive nearly on a level with the skin, it is generally termed an ulcer; there are numerous healthy secreting surfaces, but an ulcer is a diseased or abraded secreting surface, and has been correctly defined a solution of continuity in any of the soft parts of the body, attended with a secretion of pus or some other discharge. Another definition, but not so intelligible, is, that it is a chasm formed on the surface of the body by the resorption of parts into the system; and a third is, a granulating secreting surface: which last is the most satisfactory. The ulcer consequent on an acute abscess in a healthy constitution, is named a healthy ulcer, from its being a process of nature to repair the breach of continuity; but the same is applicable to the syphilitic ulcer. Simple, consequently, is a better appellation than healthy to this kind of ulcer, as no diseased action can be called healthy. It is termed the 'simple purulent ulcer;' and 'ulcers in parts which have sufficient strength to carry on the actions necessary for their recovery,' and also 'ulcers tending

to heal.' In the *Philosophical Transactions* for 1819, Sir E. Home has detailed some most ingenious microscopical observations on the conversion of pus into granulations, by the extrication of carbonic acid gas from coagulated pus, forming tubes or canals, which are filled with red blood, and thus connected with the circulation: this, however, appears too chemical a process. In this species of ulcer, the granulations are bright red conical points, regularly formed, numerous, firm, and distinct; and the matter secreted is pus in a moderate quantity. These granulations, when they come to the level of the skin, form a thin film, which, if the structure of the skin has been destroyed, begins at the edge, and spreads over the sore; and in the middle, or all over the sore, if the cutaneous tissue is preserved, but never otherwise, as is beautifully exemplified in the ulceration of a gentle scald. This latter process is termed cicatrization; the new tegument, cicatrix.

The treatment of this simple ulcer is merely to absorb the pus, and afford support to the edges and the cutaneous circulation; for which a piece of lint wet with warm water, precisely the size of the ulcerated surface, and over this a large piece of oiled silk is applied, or lint thinly spread with simple ointment, and notched towards the centre, in order to give exit to the pus. For the same reason a pledget or compress of tow should be put over it, and a roller gently above all. The great art in the treatment of this ulcer is to avoid stimulating, and to preserve the new skin when formed. On renewing the dressings, which should be regulated by the quantity of the discharge, the old should be thoroughly softened with warm water before removal. When the ulcer occurs in the leg, which, from its exposed and depending situation, is most subject to ulcers, the roller should be put from the toes to the groin, as exemplified in fig. 1. of Plate III., and the patient should keep as much as possible in the horizontal position, with the limb raised on a pillow. The hairs around an ulcer ought to be shaved off, as they are a great source of irritation. Various substances are used for bandages, as calico, linen, and flannel. A lotion of the sulphate of zinc is preferred by some, and the formula is a grain to the ounce of water, with a drachm of diluted alcohol. The red lotion used

in the Infirmary consists of 30 grains of zinc to ℔ij. of water, with ʒij. of comp. sp. of lavender, and ℥ij. of spirit of rosemary. A lotion of the sulphate of copper is also an excellent application, of the strength of one grain to the ounce of water, without any spirituous addition.

The process of reparation by granulations, is now dignified by the phrase of 'the granulating action.' And the ancient doctrine of Louis and others has been lately revived, of 'there being no real reproduction of lost parts by granulation, but that the ulcer heals by contraction and consequent depression.' The best answer to this, is the reproduction of the integuments of the forehead which have been removed in the Tagliacotian operation; since it is difficult to discover any cicatrix after the lapse of one or two years.

Inflamed Ulcer.—This simple or healthy ulcer is very easily inflamed, and then it assumes the name of the irritable, or the 'inflamed ulcer,' or 'ulcers in parts whose actions are too violent to form healthy granulations, whether this arises from the state of the parts or of the constitution,' or 'ulcers which are prevented from healing by excess of action.' This condition is characterised by the sore being hot and painful, the granulations of a dark red colour approaching to purple, very small and scarcely distinguishable, the edges of the sore thin, ulcerated, or phagedenic, having a worm-eaten appearance, and the skin around the ulcer a dark purple colour. The secretion is thin, and either bloody, dirty white, or green; and is so acrid as to excoriate the surrounding skin, and even the granulations themselves. The surface of the sore is occasionally of a brown instead of a purple colour, while at other times white or ash-coloured; and there are frequently irregular elevations and depressions, as if they were excavated by the matter. This species of ulcer is produced by the slightest exciting cause.

The treatment is by the application of large anodyne fomentations and poultices, low diet, and rest in the horizontal position, with elevation of the limb, until the inflammatory action be completely subdued, which is indicated by the absence of the pain, and the diminution of the inflamed colour of the surrounding skin; by the edges becoming defined

and clean; by the sore being more florid, and by the secretion creamy and purulent; or, in other words, by the sore presenting the characters of the simple ulcer; now warm water dressing should be used, and a roller, for the first two or three days, and afterwards the zinc or copper lotion. The diet ought to be slowly increased, but no exercise allowed until the sore be thoroughly healed.

Callous Ulcer.—Both the inflamed and the simple ulcer are very liable to become stationary, and ultimately so indolent as to have no disposition to heal; it is then termed an "indolent or callous ulcer," or "ulcers prevented from healing by defect of action," and under this appellation there is both a weak ulcer, and an indolent ulcer. It is characterized by the edges being thick, smooth, callous, and of a blue white colour, and by the surface of the sore being below the level of the callous margin, and of a smooth glistening flabby appearance, there being few or no granulations, but if any, they are generally pale and languid. The discharge is frequently thin, profuse, viscid, and adhering to the ulcer; but sometimes it is scanty, and then the surface of the ulcer is of a brown colour. If the ulcer has been of any standing, the skin around is purple and hardened, but not inflamed, and the cutaneous veins are commonly varicose. The bluish-white colour of the edges is the most characteristic sign of this species. This ulcer occurs, like many others, most frequently on the leg, and generally in advanced life; all, however, are subject to it, though it prevails most in the labouring classes, and among soldiers and sailors.

The treatment consists, first, in subduing any inflammation of the skin by poultices, and secondly, in gently and gradually stimulating the parts, by the application of adhesive straps, compress, and bandage. The judicious arrangement of compresses adopted by Mr Whately, is only serviceable in this ulcer. The patient should keep in the horizontal attitude, with the leg raised, and be allowed nourishing diet, and even stimulating food. Mercury and cantharides are most powerful auxiliaries, if administered to excite the system moderately. Such a numerous catalogue of remedies is recommended for

this ulcer, that John Bell has humorously classified them into innocent drugs, humorous drugs, and devilish drugs. The most common are adhesive plaster, ointments of the red oxide and nitrate of mercury, hot dressings, which consist of equal parts of resinous ointment and oil of turpentine rendered hot, ardent spirits, solutions of nitrate of silver, nitrate of copper, muriate of mercury, oxide of arsenic, tincture of myrrh, lemon juice, blisters, and the gastric juice of ruminating animals.

The most valuable of these applications is the adhesive plaster, which should be cut into slips of from one to two inches in breadth, and of such a length as to encircle the leg, a roller being previously applied, tight enough, from the toes upwards to the lower margin of the ulcer, to support the cutaneous circulation, as illustrated in Plate III., fig. 1., when a stripe is to be put round the limb, crossing the free ends over the sore at its lower margin, and overlapping the first strap a trifle with the second, and the second with the third strap, and so onwards, until the whole extent of the ulceration be covered; over these a compress of tow, and then the bandage continued upwards to the groin. This dressing should be allowed to remain at least two days, and then the straps should be cut across with scissors, opposite the ulcer, a director being inserted between them and the skin.

The ointment of the red oxide of mercury is preferable to that of the nitrate. Warm dressings are a powerful remedy, but difficult to manage. Ardent spirits and tincture of myrrh are beneficial. The nitrates of silver and copper, the muriate of mercury, and the oxide of arsenic, are escharotics, and not stimulants like the sulphate of copper, therefore inadmissible in this species of ulcer, unless very much diluted. The sulphate of copper, even in its crude state, never acts but as a stimulant; and it is only when strong compression is combined that it seems to be an escharotic, while in reality it is a powerful absorbent. Lemon juice, also the gastric juice of ruminating animals, is good. The bluish-white callous border ought never to be excised with the knife, or destroyed with caustic, though recommended, since it is the newly formed skin sparingly supplied with blood-vessels. This callous margin indicates inactivity, and is the most favourable opportunity for

the adhesive strap. A large blister over the ulcer, is said to hasten the cure, and prove sufficient for its completion. This practice should never be had recourse to when the ulcer is large, because it is apt to produce inflammation, or even gangrene.

This indolent ulcer, the most generally met with, is frequently healing in one part, while inflamed and phagedenic in another, probably from the extent of surface involved, which sometimes extends from the knee to the ankle-joint; and in this case, the inflammatory and phagedenic disposition must be thoroughly subdued by fomentations, poultices, rest, and low diet, before any attempt be made to heal the callous portion; and even when this irritability has been removed, caution must be observed in having recourse to the exciting treatment, so that simple warm water dressings, or bread and water poultices, may be advantageously applied for two or three days. The same inflammatory and phagedenic action is also liable to invade this ulcer while under treatment, when the same means must be adopted. In all cases where there is a varicose intumescence of the saphena veins, it should be obliterated with the potassa, above the seat of the ulcer. After an ulcer is healed, the patient should wear a bandage or laced stocking for life, with a guard of the size of the cicatrix.

Sluggish Ulcer.—There is a species of ulcer between the callous and the phagedenic, which begins in the subcutaneous cellular tissue, and this latter substance is in such circumstances prone to sphacelation, and assumes the appearance of knots, which cause ulceration of the skin by pressure, and ultimately a number of small ulcerated points progressively enlarge. The integuments in this ulcer are often extensively undermined in all directions. It attacks every region of the body, but more especially the limbs, and is named by some the weak or sluggish ulcer. The treatment consists in incising with a probe-pointed bistoury, or destroying with the potass, the undermined integuments, while, through the medium of the constitution, the contiguous structures must be roused to vigorous action, so as to throw off the sphacelated cellular tissue. As soon as there are healthy granu-

lations, the sulphate of zinc or copper is the best application. In some cases, the ulceration involves the ankle or knee-joint; in others, the tibia and fibula are rendered carious, when amputation is demanded. I have seen it also attack the face, the palate, and inside of the cheeks.

Fungous Ulcer.—The fungous ulcer is merely the simple ulcer, which, instead of cicatrizing, shoots forth luxuriant granulations, that become pale and flabby, and, when the sore is small, are termed, in common language, proud flesh. Neither the irritable nor the callous ulcer can produce these exuberances, for in the former there is too much action, which checks their production, and in the latter the action is defective. I have met, however, with one instance of fungous granulations in a callous ulcer, but in this individual there was an extensive nævus maternus from hip to great toe; and here the peronei tendons sloughed away. These granulations are found in the venereal and scrophulous, as well as in the cancerous and carious ulcers; in the latter these excrescences are best exemplified. The treatment is to reduce the granulations by the potassa, or the nitrates of silver or copper, to the level of the skin; then they generally cicatrize.

Phagedenic Ulcer.—By the phagedenic ulcer, is generally understood Gangrena Phagedæna, or hospital gangrene, but there is a phagedenic ulcer not of a sloughing or mortifying disposition, although it eats away to a horrible extent: it is termed by Sir A. Cooper, the gangrenous or sloughing ulcer. It occurs commonly after a sore has been neglected or suffered to remain too long open, and not rarely in the syphilitic constitution. It is characterized by irregular knotted edges, smooth and flat on one side, high and rugged on the other; and by its healing in some points, and spreading rapidly in others, but still advancing in extent; the surface also sometimes looks well, at others ill; the discharge either purulent, or thin and ichorous, is sometimes attended with hectic fever; the skin around is purple and violaceous, and more so where it is phagedenic; the pain is very acute, and at times quite insufferable; the inflammatory action is more frequently

chronic than acute, aggravated occasionally by some irritation. This ulcer attacks the integuments of the legs, the labia of the female; the penis, scrotum, groins, and nates of the male.

The treatment consists in subduing irritation and inflammation by anodyne fomentations and bread and water poultices, low diet, and rest; next the application of the nitric acid or nitrate of silver every six or eight days, the bread and water poultices being renewed intermediately. The application of the potass to this ulcer when small is the best, and the decoction of sarsaparilla, with the compound calomel pill, may be given. The diet afterwards should be mild, consisting of vegetables and fruits, poultry, eggs, and milk. The chief object to be observed in this ulceration, is to endeavour to arrest its progress, and change it from the inveterate to the simple ulcer; and nothing is so beneficial in the treatment of this and all inveterate ulcers as change of air. This ulcer may be termed the simple phagedenic. There is a well marked case of it, in the Chatham Hospital Transactions, Vol. I., communicated by the late Dr Schetky. The patient recovered by change of air.

Noli me tangere.—There is an ulcer so closely resembling the phagedenic sore, that it ought to be considered of the same kind, but with this peculiarity, that it only attacks the face; from its supposed contagious nature it is named *Noli me tangere*, and is classed by authors under the herpetic ulcer. It generally begins at the alæ of the nose, but not unfrequently in the upper or even the lower lip, also in the forehead or angle of the eye; hence no part of the face is exempt; it spreads upwards, downwards, and centrad, until it remove the whole countenance, producing hectic fever and repeated hemorrhagies, till death close the scene. Its characters are identically the same as the phagedenic ulcer last described, and need not therefore be repeated. When the ulceration is preceded by a yellow pustular or scabby eruption, surrounded by a violet-coloured circumscribed inflammation, it is named Lupus. The moist yellow spots either falling off, or being picked off, expose this ulceration, discharging a thin serous acrid matter. When the inflammation is moderate, there

is commonly little pain, but when severe, there is an acute burning pain, with more or less fever. It is a most inveterate ulceration, and, unless treated in the earlier stages, often defies the surgeon.

The treatment should be the same as that of the simple phagedenic ulcer; but if the ulceration continues inveterate, the whole base should be excised if practicable, and if not, destroyed with the potassa or the nitrate of copper. Probably our best practice, in all cases where the ulceration is limited, is to perform excision very early. Many authors consider this disease constitutional, and recommend internally, arsenic, antimonials, mercury, purgatives, and sudorifics, with vegetable diet and warm baths. There does not appear, however, the least ground for this opinion, since it begins locally, and continues so nearly to the conclusion of the horrid scene. What seems to have deceived us on this subject is, that all ulcers heal from the powers of the constitution; consequently, when these are too vigorous or too languid, the healing process does not proceed. The constitution, as well as the ulcer, requires to be sound.

Tinea Capitis is also classed with this ulcer, and it is a variety of the herpetic or creeping ulcerations. Tinea capitis, porrigo, or scald head, consists of six species, according to Bateman, but I limit myself to three,—the porrigo furfurans, decalvans, and the scutulata; for the larvalis, lupinosa, and favosa, are modifications of these. Porrigo furfurans, or tinea capitis, begins with an eruption of small achores, the excoriation is slight, and the discharge concretes and falls off in innumerable thin laminated scabs. Fresh pustules arise and follow the same course, until the greater part of the scalp of the head be involved. The hair partly falls off, and there is intolerable itching and soreness. This affection commonly begins in early life from inattention to cleanliness, or a peculiar prejudice of the parent against washing the head of the child.

The treatment consists in shaving the head, applying a large quantity of resinous ointment at bed-time, in order to soften the attachments of the crusts, which, on the following morning, are

to be washed off with soft brown or black soap and warm water. The ulceration is then to be treated as recommended for the simple phagedenic ulcer. Pure nitrate of silver is the most prompt remedy. This ulceration is also considered constitutional, and even infectious by many; but it can be no more constitutional than *noli me tangere*, and to consider it infectious appears truly ludicrous; but its contagious character is completely established. In the application of escharotics to the scalp, we must attend to their stimulating effects upon the brain, because hydrocephalus has supervened.

Porrigo Decalvans, or baldness, occurs in irregular patches, which, examined with the microscope, exhibits distinct elegant little ulcers. This requires the same treatment with the furfurans. *Porrigo scutulata*, or herpes circinatus, or ringworm, attacks the scalp, face, and neck, in the form of separate patches, of an irregular circular shape, resembling the fairy rings made by some of the fungi, from which it derives its name. It begins with clusters of small, light yellow pustules, which soon break and form scabs or scales, beneath which a delicate ulceration is perceptible. When neglected, it spreads all over the head in the form of clustered patches. The treatment is precisely the same with that for tinea capitis, and it is frequently as obstinate. A variety of remedies are recommended for both of these ulcerations.

Plica Pilonica is a variety or modification of porrigo furfurans. The hair is matted together by a greasy filthy discharge, emitting a most offensive odour, and when the hair is removed, there are large excavated ulcers of the phagedenic type, discharging a thin acrid offensive matter. It is described as a very peculiar affection, and is said to be confined to Poland and Lithuania; but cases occur occasionally in this city, one of which fell under my care in the summer of 1830. Authors describe the hair to be thicker than natural, elongated and convoluted, and to have blood-vessels shooting into the bulbs; and affirm that the disease is highly contagious; that it is preceded by porrigo, by profuse discharges of perspiration from the head, hemicrania, pains in the neck, back, shoulders,

loins, and extremities. The treatment should not differ from that of porrigo furfurans.

From the description given of the preceding ulcers, it must have struck the reader, that all of them have more or less attendant inflammation, and that all require in the first instance fomentations or poultices, to subdue this excited action; that then the true characters of the ulcer become apparent, and indicate whether it requires warm water dressing, or stimulating lotions, or being destroyed with the potass, or nitrate of silver.

Chronic Hypertrophy of the Scalp.—There is a peculiar ulceration with chronic hypertrophy attacking the scalp, which may be considered here. It is more a thickening of the integuments than ulceration, but there are occasionally extensive sinuses, and a profuse secretion of pus, with disease of the periosteum, and even the cranium. It begins by a thickening of the integuments with achores on the surface, both of which make progress, until the skin be puffed up and divided by deep sulci, into compartments of various shapes and sizes; these latter ulcerate and communicate by sinuses, thus undermining and destroying the scalp, and involving the periosteum and even the bone. In some cases, acute pains are felt not only in the head, but all over the body. Some have laboured under rheumatism, others, syphilis. When noticed early enough, the potass destroys this morbid condition of the integuments, which then heal by means of bread and water poultices. When neglected, the sinuses must be laid open, and only partially if very extensive; the potass must still be applied, and afterwards the poultices. Alteratives, such as the sarsaparilla, or the nitric acid, should be prescribed.

Hospital Gangrene.—Gangrenous phagedenic ulcer, or hospital gangrene, named also malignant ulcer, putrid ulcer, sloughing sore, contagious gangrene, phagedæna gangrenosa, gangrene humide des hopitaux, and pourriture d'hopital, is divided by some authors into two, and by others into four varieties, which is evidently superfluous. This ulceration attacks all kinds of ulcers, wounds, and even blistered surfaces, not only

in hospitals, ships, and in low crowded filthy situations, but even in the purest atmosphere; and the smaller the sore, the more liable is it to be attacked. The ulcer or wound, from the secretion being checked, becomes covered with a dirty white coloured slough, or with a tenacious viscid ash-coloured matter; the edges are surrounded with an erysipelatous blush, and more or less œdema. The patient feels little other pain in the sore than the sensation of a sting from a gnat; he is attacked with rigors, has a foul tongue, loaded constipated bowels, excessive thirst, and soon active fever. On the following day probably, the ulcer has sloughed all round, and may be of double, or even quadruple its original size, and in a few days becomes of such magnitude as to endanger his life. The edges and base of the ulcer slough with alarming rapidity, the former becoming hardened, ragged, and everted, and having a most irregular shape, while the latter or granulations are large, tumid, and distended. On the sound skin surrounding the ulcer appear small dark coloured vesicles which burst, and form sloughing sores ultimately communicating with the original. The discharge is sanious, ichorous, viscid, and of a peculiarly offensive odour. The patient now suffers incessantly from burning, lacinating pains. Fresh flabby blackish sloughs are rapidly formed, which overtop the ragged inflamed edges; these are immediately involved, until such an extent of ulceration be produced, as either to expose a number of blood-vessels, usually veins, which by repeated bleedings exhaust the patient, or the ulceration carries him off by the debility consequent on so great a source of irritation, or he dies of typhus, or hectic fever. The tunics of the arteries resist this frightful phagedena longer than the other textures do.

This ulcer is described to have occurred spontaneously; but this seems very doubtful, for it is more probable that some source of irritation existed, as the pulling out of a hair, or the prick of a pin. Some authors contend that the febrile affection always precedes the ulceration, and if by this is meant, that a patient, while affected with a simple ulcer or scratch, is attacked with fever, which, from the nature of the atmosphere, and the state of his constitution, assumes a very violent type, and readily disposes this trifling ulcer to acquire this gangrenous character,

it is no doubt correct, as is satisfactorily proved by the cases of Blackadder. The lymphatic glands of the groin or axilla, whichever extremity is affected, are generally excited early, suppurate, and assume this phagedenic ulceration; or they suppurate and heal kindly; while on other occasions they merely swell. This suppurative and healing process suspends the phagedenic disposition of the original ulcer. By some authors it is stated that the syphilitic, cancerous, scrophulous, and variolous ulcers, are not liable to phagedena, an error very satisfactorily confuted by Drs Thomson and Hennen.

The treatment of this formidable disease, is by the vigorous use of the lancet in the beginning or the stage of inflammatory fever, and by repeating it as long as this diathesis remains. The inflammatory action does not last long, in consequence of the great debilitating causes; still if we do not bleed during the inflammatory stage, the fever will continue to rage, the ulceration will be the more extensive, and consequently the debility greater, which is clearly and satisfactorily proved by the various cases on record, and is daily evinced in the treatment of continued and typhus fevers. The propriety of blood-letting is supported by Drs Trotter, Hennen, and Boggie. The application of the actual cautery, see figs. 6, 7, 8, of Plate I., to the ulcer, followed by hot dressings, and over these dry lint, tow, and the most gentle bandaging is indispensable. What is termed the eighteen-tailed bandage (see Plate III. fig. 2.) deserves to be preferred in such cases. The ulcer should be cleared as much as possible from sloughs and moisture, previously to the use of the cautery, which should then be applied over the sore, particularly to the edges, and be repeated whenever there is the least tendency of the ulcer to spread. The actual cautery and compression are the only remedies for ulcerated arteries, because they will not bear the ligature, however remote from the diseased part, and a fresh wound would instantaneously assume the gangrenous action. The hot dressings should be applied as hot as the patient can bear, and be removed whenever they are moistened with matter, which commonly occurs twice or thrice a-day, and the sore, at each renewal, ought to be washed with a warm solution of the subcarbonate of potass, of the strength of ʒij. to the ℔. of

water. No sponge but lint and tow should be employed, which ought to be immediately burned, as cleanliness is of vital importance in the treatment. The bandages, after being thoroughly washed, ought to be immersed in lime-water, or solution of chlorid of lime, for some hours, a practice of very beneficial consequence in hospitals. In the inflammatory stage the patient should be sponged with hot water once or twice a-day, or the vapour bath can be administered in bed. If possible, his linens and bed-clothes ought to be changed daily, and the most free ventilation admitted. His diet during the inflammatory stage should be mild, and consist chiefly of ripe fruits and succulent vegetables, if the season permits.

Great debility is to be anticipated; therefore, whenever the inflammatory diathesis has been subdued, the diet must be nourishing, with a liberal allowance of wine, and porter if the bowels are not relaxed. Large opiates and the sulphate of quinine should be given. Hospital gangrene is peculiarly liable to relapse, on which account the greatest attention should be paid, until the wound or ulcer be completely cicatrized, and perfect health restored. An extraordinary variety of remedies has been used, the most efficacious of which are, the concentrated or diluted mineral acids, the nitrates of copper or silver, or solutions of these, also the solutio arsenicalis. Amputation is inadmissible in consequence of the violent inflammatory fever present, which converts it into a case of mortification arising from an internal or constitutional cause. The daring and convincing experiments of Blackadder, and the narratives of Trotter, and J. Bell, together with the experiments and observations of Olivier, satisfactorily establish that it is not infectious, but its contagious nature cannot be questioned.

Scorbutic Ulcer is now rarely met with. It begins with lassitude, indigestion, bleeding of the gums on the least touch, and roughness of the skin resembling that of the goose. The muscles become rigid, the gums spongy, effusions of blood take place in different parts of the body, frequently under the skin in the form of large livid blotches like ecchymosis, and generally on the lower extremities; and the slightest bruise pro-

duces a tumour containing effused blood, which is very liable to ulcerate. The legs become œdematous, the face has a livid bloated appearance; he is soon attacked with diarrhœa, which is often accompanied with blood, the hemorrhage being either spontaneous, or arising from the most trifling injury. The least degree of exertion produces laborious breathing, and any attempt to raise himself to the erect posture may produce fainting and even death. If the individual has been affected with ulcers, these break out again; and if he has had a fractured bone, the union dissolves and the ends separate. Ulcers also occur spontaneously, and they are all characterized by livid edges, puffed up by luxuriant fleshy excrescences under the skin, by want of granulations; the flesh at the bottom of the ulcer is dark, grumous, soft, and spongy, and generally covered with cakes of coagulated blood, which adhere so closely as to be with difficulty wiped off. The discharge is thin, fetid, and mingled with blood. As the ulcer advances, a soft bloody fungus shoots forth, which acquires in twelve hours an enormous size, and even when removed with the knife, is as quickly regenerated. This was compared to the liver of the bullock by the sailors of Anson and Cook. Scurvy is produced by living exclusively on animal diet.

The treatment of this disease consists in the internal use of fresh fruits and vegetables, particularly of such fruits as have the citric acid, and those vegetables which are acid and succulent, as in the class Tetradynamia; also the alliaceous plants in the class Hexandria. Porter and spruce beer are beneficial remedies. The patient should be in a large well-aired apartment, and remain constantly in the horizontal attitude, taking his food in bed, and using a bed-pan and urinal when the calls of nature occur. The ulcer is to be treated with lime or lemon juice and gentle bandaging, but the chief object is to change the diathesis to one of health, and then the ulcer soon heals, and even disunited bones become consolidated.

Mercurial Ulcer.—When the syphilitic ulcer has been imprudently treated with mercury, without science or system, it inflames, becomes irritable and phagedenic, and is then named

the mercurial ulcer; it has irregular hard edges, a deep sloughing base, a dark coloured redness around; is apparently covered with a delicate pellicle in one part, while it is rapidly increasing in another. The mercury being discontinued, its treatment consists in opiate fomentations and poultices, in giving large doses of the sulphate of magnesia, small doses of sulphur frequently repeated, the use of the warm bath, and avoiding every exertion.

The Scrophulous Ulcer, properly speaking, is any ulcer occurring in the scrophulous constitution, so that it may be either simple, inflamed, or indolent, &c. It is generally very indolent, and undermines the skin to a great extent before rupturing; hence it should be early incised, otherwise the potass requires to be extensively used to destroy the morbid skin. The constitution must be renovated with quinine or iron, animal food, port wine, dry warm air, and gentle exercise.

There are two ulcers, which attack the arm and leg occasionally, but of these I have only met with a few examples; the one may be termed the warty, the other the malignant.

The Warty Ulcer presents numerous warty projections above the level of the skin, accompanied with a profuse sanious discharge, and emitting blood on the least scratch or irritation. The surrounding integuments have an inflamed violaceous colour, and there is acute pain attending it. It appears malignant. One case resisted the application of potass, the acetate of lead, and every escharotic, and exhausted the life of an aged woman, who declined suffering amputation.

The Malignant Ulcer has a deep excavated base of great extent, with either few or no granulations, or warty excrescencies, and a sanious discharge, or large flabby growths, with an extensive violaceous skin. In one case the fore-arm required amputation; in another the poples, which proved fatal from exhaustion, before amputation could be proposed. In my museum are drawings or casts of all these ulcers.

PHLEGMONOUS TUMOURS OR INFLAMMATIONS.

A Phlegmon, from φλεγω, named in common language a boil, is distinguished by the colour being of a dark purple hue, by the inflammation being circumscribed, by tumefaction, and by an intense pain, which soon becomes throbbing; when this tumour is pressed upon with the finger, the purple colour disappears for a moment. In the treatment, anodyne fomentations or poultices, gentle laxatives, mild diet, and rest should be ordered; and after suppuration, it is to be treated as an acute abscess. It is very liable to suppurate, probably its best termination; and occurring in the axilla or groin, and there involving a gland, it is styled a bubo. When these phlegmons occur on the face or scalp, they may disturb the whole system, and then they require the treatment recommended for general inflammation, together with blisters to the nape of the neck. Phlegmons occur commonly about puberty, and sometimes after fever. To prevent their recurrence, attention must be paid to diet and exercise, the former light and nutritive, and the latter active. When phlegmonous inflammation involves an extent of surface, as the hand, it should be punctured freely with the lancet, the flow of blood promoted by a fillet being round the wrist, and the hand immersed in hot water.

Furunculus or boil, a species of phlegmon, is an exceedingly hot and painful tumour, varying in size from that of a pea to a pigeon's egg, circumscribed, hard, prominent, of a purple colour, and of a conical shape. A white or livid pustule soon forms on its apex, but the tumour suppurates slowly, secreting only a small quantity of matter mixed with blood; the greater proportion of it becomes gangrenous, and forms a firm slough, of dead cellular substance named in common language a core. If left to itself, this tumour is very slow of bursting and discharging the slough; there remains a deep cavity, with a circumscribed hard base, which continues to discharge the bloody matter, and is very long in healing. When there are two or more boils, which is no uncommon occurrence, there is more or less symptomatic fever; they also frequently

appear in succession. They generally take place in loose cellular tissue, as that on the nates and back part of the thighs, but sometimes on the face and hands, for the most part about puberty, and in the spring, probably from the excitement given to the constitution at this season, and when the system is undergoing the changes peculiar to that time of life. The treatment of this tumour, during its inflammatory stage, is the same as that for phlegmon, and when suppuration has taken place, by a crucial incision. The treatment for the ulcerative stage, is the same with that recommended for ulcers, whether of the irritable, simple, or callous type. The slough is very tardy in being thrown off, and sometimes requires hot dressings. To prevent the recurrence of boils, the diet should be mild and nutritive, the bowels attended to, and the patient take plenty of exercise in the open air. An alterative, as the sulphas potassæ c. sulphure, may be given; let a drachm be dissolved in a tumblerful of cold water, and taken early in the morning. To children, a few grains of rhubarb, with the supercarbonate of soda.

Anthrax, or carbuncle, another species of phlegmon, is merely an aggravated or more violent species of furunculus, generally attacking the debauched aged constitution in the lower ranks of life; it is an extensive, flat, hard tumour, of a dark purple colour, darker in the centre than at the circumference, and feeling very deeply seated. It commonly occurs on the back between the shoulders, involving the dense fibrous aponeurosis over the trapezii muscles, but occasionally on the hands and face, and begins with great heat and acute pain, a diffused tumefaction, followed early by a small itching pimple, which soon becomes a vesicle or blister, and bursts, discharging a thin brown or bloody sanies, followed by the appearance of a yellow-coloured slough. Sometimes, by the patient scratching, several pimples are produced, which become intolerably itchy; at others, several vesicles, which spontaneously burst, and discharge the bloody sanies. When the disease is left to itself, these apertures slowly ulcerate, and run into one another, exposing to view an extensive slough, which, when thrown off, leaves a large ulcerous cavity, discharging bloody

sanies. When the carbuncle is large, or when there are more than one, there is severe inflammatory fever running rapidly onwards to typhus.

Whenever a carbuncle begins, it should be incised with the bistoury to relieve the tension, large anodyne poultices or fomentations applied, and as soon as suppuration takes place, it ought to be divided by a crucial incision, or even cut in every direction, and have the potass applied, to destroy the sensibility of the inflamed skin, and to rouse the contiguous structure to vigorous action, that the slough may be thrown off; the poultices must be continued until the slough be discharged, when it should be treated like an ulcer, portions of it being removed from time to time as they become loose.

There is a variety of carbuncle, named the *malignant pustule*, which is characterized by a black centre, and a very deep purple inflammation, the whole having a black or mortified aspect. This is frequently developed among butchers, particularly on the Continent, where it is considered to be endemic, and even contagious. Butchers in this country have often a peculiarly coloured erythema on their hands, which is so dark as to resemble venous blood effused beneath the cuticle. I have treated this malignant pustule in the same way with the common anthrax, and with success. There is a variety of malignant pustule, which attacks the natives in the interior of Africa, on the calf of the leg; it spreads so as to remove by gangrenous sphacelation the whole limbs, and ultimately proves fatal. But if the individual be removed a hundred miles distant, he recovers even after it has extended considerably; though all means devised by the natives and Europeans have failed to arrest its progress.

Chilblains.—Chilblain is that kind of phlegmonous inflammation which attacks, in cold weather, the fingers, toes, and heels, and occasionally the nose, lips, and ears, particularly of those leading a sedentary life, and women more frequently than men, and children than adults. The parts affected are of a purple colour, swollen, hot and painful, and not unfrequently suppurate, and even mortify. Small serous vesicles often appear, which burst, and become fretful, troublesome

ulcers. These may penetrate to the bone, and discharge a thin ichorous or sanious matter, producing caries, which ultimately requires amputation of the limb. These ulcers are sometimes covered with sloughs, or the inflamed part at once ends in gangrene, and then sloughs.

Chilblains should be treated, in the inflammatory stage, like phlegmon; during the suppurative, like acute abscess; and in the ulcerative stage, like the irritable, simple, or callous ulcer, according to circumstances; and when gangrene occurs, the treatment detailed under mortification should be adopted; and if caries supervene, the remedies recommended under that disease of the bones. When chilblains have been cured, they are very liable to recur, the parts should therefore be rubbed with rubefacients, kept warm, and in as frequent motion as possible. The most heterogeneous medley of remedies is given in some surgical works.

Paronychia, or *Whitlow*, named also Panaris, Onychia, Onychia maligna, and Panaritium, is so common an affection of the finger, that all are familiar with it. Some writers, however, make out a number of species, which subdivision appears truly frivolous; in general, the more the finger is diseased, the more the hand, fore-arm, and arm suffer. It is usually a phlegmonous inflammation attacking the finger near the point, but sometimes is erysipelatous, and arises from a variety of causes, some of which are very obscure, or entirely unknown. The causes are cold, a piece of the nail fretted, or what is vulgarly termed rag-nail, a prick or wound in the finger from a thorn, small splinter of wood, needle, hook, scalpel, forceps, spicula of bone, a broken bottle, an abrasion, or dirt getting access to the cutis beneath the nail. The finger assailed has generally a swollen inflamed appearance, and a painful hot throbbing sensation. In some cases, the malady is confined to the nail and its vicinity; in others, the finger is distressed with an acute pain extending to the hand and fore-arm, with little or no tumefaction; in some instances the pain is confined solely to the finger, unaccompanied with tumefaction. When confined to the nail, and neglected, there commonly shoots forth a fungoid excrescence, and the finger

becomes swollen and deformed. From what has been stated, a whitlow may be considered a disease of the finger, of an inflammatory nature, attacking one or all the structures, rapidly terminating in suppuration, and occasionally in gangrene even of the bones; and since the inflammation, suppuration, and gangrene are liable to extend upwards along the arm, fatal consequences may ensue.

The finger is exceedingly sensitive and vascular, whitlow should therefore be treated early and vigorously. If the finger is merely inflamed, and no degree of tension, warm poultices, with rest and low diet, will be sufficient. Nitrate of silver in the dry state, or nearly so, is sometimes rubbed over the finger, with the view of checking the inflammation; but being liable to deceive us when matter is formed, it is an improper remedy. If there is tension, or matter secreted, a longitudinal incision of some depth should be freely made in the centre of the finger, on the palmar aspect, avoiding the sheath of the flexor tendons. When the cuticle acts as a sheath, and restrains the expansion of the inflamed finger, it ought to be cut off with scissors; and when matter insulates the nail, the latter should be removed with scissors and forceps, otherwise a fungous excrescence germinates around it, forming what is termed *ulcus mali moris*, or in common language, the growth of the nail into the flesh, when the slightest motion causes exquisite pain. The nail then is more difficult to remove, there is more pain, and the excrescence requires to be removed with the scalpel or escharotics, or both. The best escharotic is potassa. This latter variety often attacks the toes, especially the great one, and various ways have been devised to remove this source of irritation by Paré, Dupuytren, and Wardrop, the best of which is to seize hold of the nail, or that portion of it to be removed by ordinary pliers, and then insert the one limb of a pair of strong scissors beneath it and cut it away. If the removal of the nail does not cure the ulcerated condition, or if the matrix seems originally affected, this latter should be excised, by making an incision with a small scalpel round the healthy structure, and then shaving off all the ulcerated surface down to the periosteum of the last phalanx.

If the hand be involved in the disease, it should be treated

as recommended for erysipelas; and if the inflammation still continue, one or two incisions should be made in the palm of the hand, to divide the palmar fascia, so as to remove the tension, and obviate permanent contraction, care being taken not to wound the palmar arch of the ulnar artery; an incision may also be necessary on the back of the hand. If the disease extend to the fore-arm or arm, the same treatment will be required as in erysipelas phlegmonodes. In this affection, the phalanges of the fingers become soon carious, proving the necessity of active treatment; and whenever the bone or bones are ascertained to be bare or rough, they should be removed, either by extracting them individually, or by amputation. On some rare occasions, the disease becomes chronic, the finger degenerates into a carcinomatous condition, and requires to be amputated. The thumb and great toe are the most common digits so affected.

The fascia palmaris, especially the threads extending along the fingers, are frequently so contracted as to impede the functions of the fingers, or even of the whole hand, and should therefore be early divided by a cross incision, the fingers being afterwards kept straight by a piece of wood. If neglected, the tendons are gradually contracted, and the joints of the fingers ultimately dislocated.

Punctured Wounds in the Dissecting Room.—Pure and simple Whitlow, the most common effect of punctures in the dissecting room, is frequently produced from the puncture of a hook, scalpel, forceps, needle, or the spicula of a bone, in the examination of the viscera of the thorax or cranium. In the mildest cases, there is merely a small serous vesicle of a milky colour, filled with a fluid more or less purulent, and surrounded with an erysipelatous or phlegmonous blush. In the severest cases, the disease is either at once ushered in with rigors, high constitutional excitement, advancing rapidly to typhus fever, with a peculiar despondency of mind, or the inflammation extends along the fore-arm and arm to the axilla and thorax, with numerous lymphatic streaks, involving the muscles of the axilla, those situated on the thorax, and even those on the abdomen and back, resembling erysipelas phlegmo-

nodes, or inflammation of the fascia consequent on venesection at the bend of the arm: indeed the only difference between these affections is, that in this originating from a puncture in morbid dissection, we have frequently no chain of connection between the puncture and the muscles, and cellular tissue of the axilla; but the same want of connexion, or cause and effect, appears to exist in erysipelas succeeding to phlebotomy. There can scarcely be a shadow of doubt, that in both of these cases, some exciting cause must have existed; and that although the wound healed in either without being observed, yet nevertheless it must have inflicted irritation or excitement, or a morbid action, in a lymphatic, a nerve, or a blood-vessel, which has not been called into action until the constitution was influenced either by stimulation, or by fever from cold. I have known many, by indulging in wine, or when attacked with febrile symptoms, rouse to action such punctures apparently healed. The lymphatic vessels appear to be those which suffer, because the axilla is the most frequent seat of the first development of this malady, and though the glands situated there are not very susceptible. The greater number of individuals is attacked in consequence of being punctured while labouring under pyrexia. The mind has a powerful influence here. Punctured wounds inflicted by bayonets, small swords, and such weapons, produce equally violent constitutional effects; and such instruments, by piercing the various tissues, as the nervous, vascular, cellular, and fibrous, naturally excite more violent inflammatory action, than when such tissues are divided by the cut of a sabre or amputating knife.

Assuming this view to be correct, I must next ascertain whether any poisonous matter has been absorbed. The fact of the same affection being caused by clean lancets, clean needles, common skewers, delicate splinters of wood, various kinds of thorns, the spiculæ of the bones of the ox or sheep, broken glass, or an abrasion of the finger against a wall, should at once negative the question of absorption; for since to the same causes we are entitled to ascribe the same effects, why should we search for the unknown and fanciful, when the simple and natural are before us? Before the time of Paré, musket bullets were supposed to be poisonous, and there are

modern authors who believe, that Malaria travels, like the carrying pigeon, from Italy and Holland to London!

Some authors assert, that recently dead morbid animal matter is more poisonous than putrid, while others the reverse; and some think that the saline solution employed in injecting dead bodies is a corrective. If what has been advanced is correct, it follows that putrid dead morbid matter, and saline dead morbid matter, should be more irritative than recently dead morbid matter. I do not mean to deny, that putrid dead morbid matter may be absorbed, although it is well known that the syphilitic virus and many other living poisons cease to affect the system the moment death takes place; but I do mean to deny, that absorption occurs in punctured wounds, producing erysipelas phlegmonodes, or diffuse inflammation of the cellular tissue.

By some a specific virus is supposed to be generated in the dead body, but this is fallacious if I am correct in the theory. It is also imagined, that this virus is absorbed even when the skin is sound, in those constitutions considered to be peculiarly susceptible of the impression of dead animal matter, and that gloves, oil or lard, are excellent prophylactics; but that these are totally inert, there appears scarcely a shadow of doubt. Some authors contend, that a person engaged in dissection, will resist this disease and the putrid effluvia better if his diet be nutritious; but the very reverse ought to be the case.

With regard to fever, I have already stated, that idiopathic inflammatory fever is caused by the application of cold to the body while heated. The same appears to be that of all other fevers, with the exception of hectic; I am of opinion, therefore, that neither putrid effluvia, marsh miasmata, nor pestilential vapours, ever give rise to fevers. These effluvia appear only to render the constitution ill-conditioned, and more susceptible of cold, and hence, when attacked with fever, aggravate all its symptoms.

The treatment of this erysipelas phlegmonodes, originating in punctured wounds, is as various as its theory, which must ever be the case so long as we are ignorant of the correct pathology; it equals the farcical display of a thousand reme-

dies applied to ulcers, so humorously described by John Bell. Nor has the general treatment been more consistent than the local. When suppuration is established, all are agreed that free vent should be given to the matter.

The treatment of this should be prompt. The arm should be raised above the level of the body, and fomented constantly from the finger to the axilla; a brisk mercurial purgative given, followed by the antimonial solution and effervescents; and, if the fever be inflammatory, a vein of the opposite arm opened. Whenever any suppuration has taken place, free incisions should be made. Whenever typhoid symptoms begin, calomel and opium should be given, and wine with quinine, while their effects on the constitution are to be assiduously watched. The reader is requested to consult inflammatory fever, inflamed lymphatics, and erysipelas. In the last stages of this, as of other fatal disorders, hiccup, which is an inverted action of the stomach and diaphragm, is no unfrequent concomitant, but it is easily checked by the patient sipping any bland fluid, and swallowing it without intermission until the hiccup cease; afterwards he must avoid speaking, for it is exceedingly liable to return; sneezing and coughing reproduce it.

MORTIFICATION.

Mortification is one of the ordinary terminations of inflammation, when the inflammatory action is so violent that the nerves, arteries, and veins are overpowered; while the contiguous tissues are destroyed both by the action, and by being gorged with blood, which, in consequence of not being kept in motion, coagulates, and compresses the capillary circulation.

In the experiments performed by Dr Hastings and M. Gendrin, it was found, that when irritating substances were long continued to the membrane of a frog's foot, the circulation ceased altogether, the blood formed a homogeneous mass, its colour changed to a brownish yellow, which gradually assumed a darker hue, becoming dark brown, and even black; that all the parts in which these phenomena occurred, become more and more soft and flaccid, were transformed into a gangrenous mass, and finally separated in the form of an eschar:

the inflammatio debilis of Burns and others, appears therefore inapplicable, and the notion is best confuted, in gangrene consequent on severe injuries. This is usually denominated acute gangrene, also inflammatory, humid, or traumatic. There is also dry or chronic gangrene, dependent on a constitutional cause; humid or moist is likewise applied to acute gangrene when it attacks soft tissues, and dry, to either acute or chronic when hard fibrous tissues are involved. I should prefer the following as being more natural, viz. gangrene preceded by acute inflammation, and that by chronic inflammation; gangrene consequent on a local, and that on a constitutional cause. Gangrene is confined to that degree of mortification where sensibility, motion, and warmth are not extinct; but when these phenomena cease, and the part assumes a livid, brown, or black colour, it is termed sphacelus, or complete mortification. Etymologically, these terms do not admit of this explanation, gangrene being derived from γαινω, and sphacelus from σφαζω. Some authors use both terms synonymously, while others consider that sphacelus should be applied only to mortification extending to the bones. Mortification thus dependent on a severe degree of inflammatory action, is originally produced by chemical or mechanical means. Of the former, there are all the concentrated acids, the alkalies, caustics, scalds, burns, and excessive cold; and of the latter, or mechanical, there are violent contusions. When the urethra or urinary bladder is injured, and the urine escapes into the cellular tissue of the pelvis, perineum, or scrotum, gangrene is frequently the result; and this also when any of the abdominal viscera forced out of their cavity are strangulated. Gangrene likewise takes place from the eating of cockspur rye, the ossification of arteries, tumours impeding the return of the blood, diseased condition of the arteries or veins producing coagulation of the blood, or lymph consequent on arteritis; also from wounded arteries or veins, from diffused false aneurism, and from ligatures applied to the trunks of arteries or veins, from divided nerves, from paralysis, from excessive cold, from long confinement to bed. Of the two varieties of inflammation, mortification is the more liable to supervene to the erysipelatous, and still more so to their combination, or

erysipelas phlegmonodes; and although all textures, when inflamed, mortify, yet the most compact, such as bone, skin, the stomach and intestines, are the most prone to it, because their blood-vessels have not room to form ulcerative papillæ. The arteries are found to possess the greatest power of resisting mortification.

When a part highly inflamed is about to become gangrenous, or is undergoing the gangrenous inflammation, the pain is violently increased, the red colour becomes deeper and extends farther, the tumefaction increases from the effusion of serum, communicating a doughy feeling; the cuticle is raised into blisters, vesicles, or phlyctenæ, and the part appears erysipelatous. There are now dark streaks or mottled spots, with a yellowish hue over the surface. The pulse is small and rapid, the tongue brown and crusted, in short, every symptom of typhus fever. This may be considered the gangrenous stage, which if not arrested ends rapidly in sphacelus, and will take place earlier or later according to the severity of the injury, or the violence of the inflammatory action; the pain and sensibility then cease; the part becomes œdematous, emphysematous, cold, black, and fetid; in some instances the colour is ash grey or brown; a profuse watery and dirty-coloured discharge is poured out, the pulse scarcely perceptible, the accompanying fever having as it were ceased, which often takes place suddenly, and carries off the patient; but a low typhoid fever more frequently continues for some days, attended with hiccup, vomiting of coffee-coloured matter, subsultus tendinum, low delirium, and diarrhœa. This typhoid fever is supposed by some to arise from the absorption of the fetid matter, but as typhus supervenes to synochus or synocha, if severe and of long continuance, we are entitled to ascribe it in this case to the same cause, viz. the violence of the fever.

The inflammation which attends compound fractures and dislocations, occasionally shows phlyctenæ, which, however, are soon absorbed; they are commonly produced by tight bandaging. In such cases there is great tension.

When inflammation of the brain terminates in the gangrenous action, it is said to end in ramollissement, or mollescence,

or softening; and when that of a bone ends in mortification, it is named necrosis.

The treatment of the gangrenous or first stage is, by making incisions with the bistoury, by applying large anodyne poultices, in the hope of subduing the inflammatory action still raging, and which is the cause of the gangrene; by keeping the patient quiet, on low diet, and administering purgatives. The constitution is generally too exhausted to bear general blood-letting. A large opiate should be given at bed-time. Should the part sphacelate, the yest or charcoal, or bread and water poultice should be used, and the strength of the patient supported with beef-tea, animal jellies, and wine, together with an opiate at bed-time. If the mortified part is to recover by sphacelation, a red line appears on the sound skin at the point of separation between the living and the dead portions, which line denotes the adhesive inflammation, soon forming the ulcerative, which producing suppurative papillæ or granulations, secrete purulent matter, so that the whole forms an ulcerated surface. Consequently, in a limb which sphacelates, no hemorrhage takes place; a circumstance also dependent on the arteries being plugged up with coagula.

Whenever the sphacelated parts have been thrown off and ulceration fairly established, the part should be dressed as a simple ulcer. The sphacelated portions should, at each dressing, be cut away with scissors.

In cases of mortification from mechanical causes, such as severe contusions or wounds, amputation may be with safety performed; but in mortification from constitutional causes, such as a diseased condition of the arteries or veins, this operation proves fatal.

Mortification may ensue from excessive cold. Acute pain is experienced, with numbness, weight, and a tingling sensation in the legs; the feet are of an obscure red, and slightly swollen. Sometimes a light red is perceived at the base of the toes, and on the upper aspect of the foot; at others, deprived of mobility, sensibility, and heat, they are black and withered. The treatment is to apply first snow or ice-cold water to the part, then camphorated spirit of wine, or poultices. When the mortification is superficial, the dead parts separate between

the ninth and thirteenth day, and leave an ulcerated surface, requiring the treatment of ulcers. When a whole limb mortifies, a slow typhoid fever, accompanied with diarrhœa, carries off the patient; or the gangrenous portion becomes bounded by the circular line of adhesive inflammation, which suppurates and throws off the mass. Amputation in such cases should be resorted to, for this mortification is as much from an external cause, as that from an external contusion. The operation ought to be deferred until the limb be thawed, and the constitution have rallied from the effects of the cold, or the reaction of the nervous and circulating systems be fairly established; but after that, the earlier the limb is removed the better. The mortification from congelation or frost-bite, and that from ergot, are named by some surgical writers dry gangrene, and by others chronic gangrene.

The eating of ergot, unsound or diseased rye, or mildewed wheat, has an influence on the constitution not unlike that which the living exclusively on animal food has in producing scurvy. The rye so impairs the nervous and circulating systems, that they become unable to perform their functions, consequently mortification invades, first, such parts of the body as are most remote from the centre of the circulation, an event that happens in all kinds of gangrene. This variety of mortification generally begins in the toes, which become red, painful, and hot, as if scalded with boiling water; in a few days these symptoms suddenly cease, then the toes are cold and insensible, dry, hard, withered, and black as charcoal. The gangrenous action now extends slowly upwards along the foot, leg, and thigh, to the trunk, accompanied with fever and delirium. In one instance, the lower extremities were separated at the hip joints from the trunk. This singular species of mortification has been observed epidemic chiefly in France, sometimes in Switzerland, and once in England. Its treatment obviously consists in relinquishing the diseased rye or damaged wheat, and substituting the finest and best wheat, with nourishing diet. The gangrened parts to be treated by hot dressings, and when the sphacelated portions have separated, the ulceration to be dressed with lint and warm water, or simple ointment, dry lint or other applications, according

to the sore. Amputation is inadmissible while the system is under the influence of the ergot; but afterwards, it might be necessary for the formation of a better stump.

Mortification occurs in protracted fevers, in compound fracture of the bones of the thigh and leg, and destruction of the spinal cord, consequent on fracture of the vertebræ; in these cases, those parts of the body which sustain the greatest pressure most readily suffer, as the region of the sacrum. To prevent pressure from producing mortification, various contrivances are resorted to; pillows of various shapes, of feathers or down, or distended with air, are employed.

Mortification attacking old age, is named gangrena senilis, and depends on calcareous depositions in the coats of the arteries; it takes place in early life from arteritis; in middle age from an insulated diseased condition of the artery, as the calcareous or atheromatous or melanotic deposit, producing softening of the inner tunic, together with chronic inflammation and ulceration, and ultimately adhesion of the fibrinous portion of the blood which plugs up the vessel. Mortification, in a few cases, occurs from the arterial circulation being too feeble, in consequence of some disease of the heart; in others, from both the arterial and venous circulation being impeded by tumours growing round the aorta and the vena cava.

Mortification sometimes ensues in wounds, or in aneurism, when the principal artery of a limb is secured by ligature; also occasionally in gun-shot wounds destroying the chief artery or vein, or both. The treatment of these will be described under diseases of the arteries.

EFFUSION.

Effusion, or Dropsy, is a termination of inflammation, when a serous or synovial membrane is affected. Of the serous membranes, there is effusion on the arachnoid membrane of the brain, constituting Hydrocephalus; that of the spinal chord, Hydrorachitis. When the serous membrane of the aqueous humour of the eye is so affected, it forms hydrophthalmia; that of the heart, hydrops pericardii; of the pleura,

hydrothorax; of the peritoneum, ascites; of the tunica vaginalis testis, hydrocele. The synovial membranes, investing all the articulations, and the synovial pouches or bursæ mucosæ, are in like manner subject to dropsy.

Besides these, there are preternatural or adventitious serous cysts, formed in various places, as in the spermatic cord, the subserous cellular tissue over the ovarium, and in the convex surface of the liver.

From what supervenes to Scarlatina, Measles, and other exanthematous fevers, it would appear that effusion of serum is consequent more on debility of the capillary exhalents, than on debility of both the exhalents and absorbents. General dropsy sometimes takes place in a few hours, if the patient makes any over exertion while convalescent, after an exanthematous fever. Partial dropsy, as that in the tunica vaginalis testis, generally follows a blow. When a joint, as the knee, is slightly inflamed, the synovia is secreted more abundantly, and more aqueous than in health.

The diagnosis and treatment of each of these dropsies so materially differ from each other, that they had better be considered under the respective organs to which they belong.

CHRONIC INFLAMMATION.

Chronic Inflammation is that inflammatory action which continues for a long period, so slow, mild, and passive, as to be sometimes imperceptible, and is considered by some authors not to exist on many occasions. The most marked example is that which follows acute inflammation of the eye, the organ continuing for months and even years, red, fretful and weak, but neither painful, hot nor fiery. All acute inflammations are liable to become chronic; but there is a chronic state which begins *à priori*, as, for instance, that which precedes lumbar and other chronic abscesses, and the formation of tumours. In superficial chronic abscess, there is sometimes tumefaction, which is circumscribed and hard, but not attended with more pain than the deep-seated abscess. In both there is constitutional derangement, and they generally occur in a feeble

frame of the scrophulous diathesis. In the progress of this disease, the local symptoms of irritation become more and more manifest. This species of inflammation generally attacks serous, synovial, and mucous surfaces, although every structure may become the seat of it. Bursæ mucosæ, as that superficial to the patella, or that under the deltoid or gluteus maximus muscles, are very often attacked, and so also is the synovial membrane of the knee-joint.

The treatment of chronic inflammation, when it attacks an exposed surface, as that of the eye, is, generally speaking, by stimulant lotions and ointments, farinaceous diet, attention to the bowels, the eyes kept from a bright light, and little or no exercise. When it attacks a mucous canal, as the urethra, by the same stimulant lotions still more cautiously used, and the same diet, with rest in the horizontal posture, and the occasional introduction of a bougie. When it attacks a deep-seated structure, such as the bursa of the deltoid, the application of leeches or the scarificator, together with low diet, gentle laxatives, and rest, may prevent suppuration; but these often require to be followed by the potassa or seton.

In deep-seated chronic inflammation, the seton or potassa induces counter-irritation, which brings the action of the vessels to the skin, and also excites active absorption; for these reasons, the more quickly the ulceration produced by the potassa heals, so as to enable another piece to be applied, the better, and hence small but deep eschars are better than large ones. The practice, therefore, of keeping issues open is now nearly obsolete. The seton excites both inflammation and suppuration throughout, and hence it is preferable to potass in this chronic affection.

Chronic Abscess is a cyst or sac of matter, the product of chronic inflammation, which occurs often in the abdominal muscles, particularly in the psoas magnus, and is then termed psoas or lumbar abscess. This species of abscess invades likewise the ovarium, and indeed every kind of structure. It appears at every age and in every constitution, but more frequently in early life, and the scrofulous habit.

We are seldom aware of chronic abscess forming until the

matter has been actually secreted, when it ought to be evacuated in the following manner:—The skin is to be pulled upwards or aside, that it may act afterwards as a valve, a small oblique aperture is to be made with the bistoury, and a director or flexible gum tube inserted into the wound, and the matter is thin, serous, and mixed with curdly flakes, but sometimes purulent. The wound is to be immediately closed with adhesive plaster and lint, and healed by the adhesive inflammation. During the treatment of chronic abscess, the diet ought to be simple and nourishing, the patient as much as possible in the open air, if dry and mild, and if the seat of the disease will permit it; he should take sulphate of quinine, some of the preparations of iron, or diluted sulphuric acid, and use at the same time tepid and ultimately cold sponging, with friction. Whenever matter has again collected, however small in quantity, it ought to be discharged. The above treatment must vary according to the seat of the disease. When the bursa is small like that superficial to the patella, it should be treated by passing a seton perpendicularly to the limb, so as to involve the whole of the bursa with the integuments, and it ought to be retained until inflammation and suppuration have been established. But when the bursa is large, it must be treated as previously described.

Lumbar Abscess.—In Lumbar or Psoas abscess, the disease begins in the periosteum of the lumbar vertebræ, or the bone itself, which inflames, ulcerates, or becomes carious; and the matter secreted, either gravitates in the tract of the muscle, being confined by its fibres or fascia, forming a tube, or proceeds directly dorsad to the integuments of the loins. If it is confined by the fascia of the muscle, the matter sometimes descends to the groin, and presents itself either below or above Poupart's ligament, near the anterior superior spinous process of the os ilium, or near the pubes; sometimes it emerges at the crural aperture, while at others it proceeds beneath the fascia lata to the poples, or even retrogrades to the tuberosity of the os ischium; at other times it gets into the pelvic cavity, passes at the great sacro-ischiatic notch, and appears near the anus. It is sometimes found in more than one of these places; in rare instances,

the matter descends along both psoæ muscles, forming two abscesses or a double abscess. Whenever the matter advances to the integuments or points, the skin at first is not discoloured, but an impulse is given to the fluctuation on coughing, and in a few days the skin becomes discoloured, inflames, ulcerates, and bursts.

The symptoms of this affection are remarkably insidious, being seldom manifest until the abscess point. The patient complains of weakness and uneasiness in the region of the loins, which are much aggravated on ascending a stair, and he is easily fatigued with walking. Occasionally there is felt considerable pain in the loins, which seems to follow acute inflammation of the periosteum or vertebræ; and not unfrequently there is distortion of the spine. As lumbar abscess is liable to be confounded with hernia and fungus hæmatodes, we must be careful in our diagnosis before opening it. The history of the case, together with the fluctuation of the tumour, which is tense in the erect, and nearly disappears in the horizontal posture, becoming softer, flatter, and looser; and when again placed in the erect attitude, the almost impossibility of preventing the descent of the matter, characterize lumbar abscess.

The treatment has been already described in the preceding paragraph, but rest in the horizontal position is indispensable in the cure, and requires long perseverance. Lime water injections, recommended by C. Hutchison, are improper. Lumbar abscess attacks youth, and the male more frequently than the female; however, Mr Abernethy cites more cases of its occurring between twenty and forty years of age, than at an earlier period.

Small chronic abscesses may take place in the subcutaneous cellular tissue, and even in the glands of the groin; these should be treated on the principle of acute abscesses. They can occasionally be cured by exciting absorption, through the medium of the tincture of iodine or blisters. The iodine is applied with a camel's hair brush, twice or thrice a-day, until the skin become brown, or feel painful, when it must be relinquished, but renewed when the skin resumes its natural colour. The constitution must be attended to by regulating

the digestive organs and the bowels, and directing the patient to take gentle exercise in the open air. In the delicate young girl, fear often produces such abscesses.

Hectic Fever.—Hectic fever, which accompanies chronic abscess when opened, is distinguished by the following symptoms. The patient begins to have a hot skin, especially in the palms of the hands and soles of the feet, a crimson blush on the cheeks, small quick pulse, loss of appetite, thirst, nocturnal perspirations, lateritious sediment in the urine, and diarrhœa. There are exacerbations in the evening, with a chilly, a hot, and a sweating stage in succession, just as in intermittent fever. This is supposed by some authors to depend on the absorption of the matter, but no hectic fever takes place until the matter has been evacuated; by others, to depend on the irritation, together with the increased discharge, but in some cases of phthisis pulmonalis, where the individual wastes away without the slightest irritation or pain, hectic fever accompanies the disease almost from the beginning; by others again, to be the consequence of a change in the system, induced by the process of suppuration, or even of the previous inflammatory action that gives rise to this process. It would seem, however, rather to be consequent on mere debility of constitution, which, whenever it is so far exhausted from a discharge in any disease, that the nervous and circulating systems have not their accustomed supply of nutriment, *i. e.* the blood, then increased absorption goes on with great rapidity, while there is no nutrition, the nutritive lymph being removed by the discharge. The hectic fever which accompanies Nostalgia, corroborates this view. Its treatment consists in light nutritive diet, diluted sulphuric acid, and the cretaceous or catechu mixture, when the bowels are affected, attending, at the same time, to the local affection producing it.

CHAPTER II.

DISEASES OF THE VASCULAR SYSTEM.

HEART.

Of the affections of the heart, the only one admitting of a surgical operation is dropsy of the pericardium, which, when the diagnosis is certain, is performed as follows: An incision is made between the fifth and sixth ribs through the integuments, but in such a way that the skin may afterwards act as a valve, and ought therefore to be pulled upwards. The greater pectoral and intercostal muscles are then to be cautiously divided, the operator keeping sufficiently distant from the sternum, so as to avoid the internal mammary artery. In this division of the muscles, the pleura costalis will most probably have been divided, as the pericardium will be generally found adhering to it; the latter is now seen distended with fluid, and is to be opened carefully with a lancet or bistoury, making a small aperture, by which the fluid will exude. If the pericardium does not adhere to the pleura costalis, the incision in the pleura must be enlarged so as to admit the finger, which, when inserted, will feel the distended pericardium, that can then be punctured with a bistoury guided along the finger. This operation was performed lately in Nottingham, but without success. Judging from the failure of paracentesis thoracis in hydrothorax, it is not likely it will prove more successful here. Besides the pathognomic symptoms mentioned in works on the Practice of Physic, there is

one much to be depended on, namely, holding the ear over the region of the heart, while the right arm surrounds the chest of the patient, with the hand applied to his back, and then gently shaking him, when undulation will be perceptible, if hydrops pericardii exist.

DISEASES OF THE ARTERIES.

The arteries are subject to many diseases, particularly inflammation and its terminations, deposition of coagulable lymph, adhesion, suppuration, ulceration and gangrene, stricture, deposit of matter nearly purulent or caseous presenting an opaque dark yellow or brownish colour, atheromatous collections, thickened pulpy substance like steatoma, cartilaginous growth, and calcareous substance between their coats, to tuberculous and melanotic deposits, warty vegetations, and lastly, aneurism; they are also involved in the inflammation and other diseases of contiguous structures. All of these accidental or adventitious results, with the exception of the warty vegetations, are secreted between the serous and muscular tunic; and of these the calcareous is much the most frequent, and is besides the most common cause of aneurism. Their precise seat is not yet established, some contending for the exterior surface of the serous, others for the muscular tunic; my own opinion favours the former.

Arteritis.—The arterial system is subject to acute and chronic inflammation, the former, or acute arteritis, may end in the effusion of lymph into the cavity of the vessel, or between its tunics, or in suppuration, ulceration, or even gangrene. Chronic inflammation comes on when an artery is inflamed in the vicinity of ulcerations and other chronic diseases; and it is questionable, whether it does not also exist in the various adventitious formations found in the arteries.

Acute arteritis, seldom an idiopathic disease, generally accompanies or supervenes to inflammation of the serous membranes, as the pleura, or of the thoracic viscera, as the lungs; and it then either proves fatal in a few days, or terminates in effusion of lymph in the arteries of the extremities, which pro-

duces gangrene, and ends fatally. The appearances on dissection are, injection from an increased number of vasa vasorum on the cellular tunic, which is thicker and softer; the muscular also thicker and softer; the serous studded with patches of a scarlet colour, likewise thickened and softened; and the three are easily separated from each other. Sometimes the serous is coated with lymph, even to the semblance of a false membrane, or is plugged up with it. The symptoms very equivocal, are liable to be confounded with pleuritis, pneumonia, carditis, angina pectoris, rheumatism of the heart, and inflammation of the diaphragm. The treatment must be strictly antiphlogistic.

When mortification of a leg takes place, it is for the most part very rapid, beginning in one or more toes, and spreading to the thigh; large vesicles or bullæ rise here and there, the skin exhibits a ruddy and leaden hue, with general tumefaction and tension; extensive gangrenous patches now show themselves, and death closes the scene. During this process, the constitutional symptoms are purely typhoid. In some cases, the gangrenous action is not so quick, but more resembles that occurring in old age from calcareous deposit, nevertheless it has been preceded by acute arteritis. In either instance, as soon as gangrene begins, wine, quinine, and animal soups should be given. To the gangrenous surface, let anodyne fomentations or poultices be applied. Amputation is prohibited, the gangrene depending on a constitutional affection, and often attacking the other limb.

Acute arteritis is sometimes confined to the aorta and its trunks, and then named aortitis; the pulmonary artery is very rarely inflamed. One of the arteries of the arm or leg has been suddenly plugged up with blood, without any preceding arteritis, the tunica intima having been lacerated, in consequence of a diseased condition of the artery, and thus forming a barrier to the free circulation of the blood, and causing it to coagulate. In such instances one artery after another becomes similarly involved, showing there is a constitutional tendency prevalent, and thus confirming the veto to amputation.

Suppuration between the tunics takes place occasionally,

and commonly between the serous and muscular, forming small abscesses; and ulcers from the size of a pea to that of a Spanish nut have been found, some round, others irregular and phagedenic. Mortification is a rare disease of the arteries, or a rare termination of inflammation of this tissue, as it resists gangrene for a long time; nevertheless we have seen, that when the arteries are attacked with acute inflammation, they undergo a gangrenous action, or are destroyed in their structure.

So early as 14 years of age, stricture of the aorta has occurred, just where the ductus arteriosus joined the arch, and in some there was total obstruction to the circulation.

The calcareous deposit often occurs in old age, and is observed in the arteries of the brain, trunk, upper and lower extremities; and when the last are its seat, gangrene is induced, named gangrena senilis. The patient in general complains of great uneasiness of the foot and ankle-joint, particularly during the night, before any disease manifests itself in the toes, which then appear of a purple colour, have a cold feeling to the surgeon, while hot and painful to the patient; but in some cases there is only a benumbed sensation for some time. The disease usually begins on the inside of the great or little toe, and not unfrequently in both feet; hence it spreads either to the other toes or upper aspect of the foot, ankle, and even the leg, and then produces so much febrile irritation as to carry off the patient. Soon after the purple colour manifests itself, more or less tumefaction follows, with vesication or phlyctenæ, a dark serous discharge, and a greenish-black pulpy appearance of the texture affected. Besides calcareous, atheromatous matter and fibrous tissue have been found in the arteries of those who have died of gangrena senilis; and when the last, the vessels have been converted into nearly solid ligamentous substance.

The treatment is by opiate fomentations and poultices, by moderately raising of the foot, the internal use of opium in small doses, and frequently repeated, but never to produce delirium or impair the appetite, and by the sulphate of quinine. The diet should be light and nutritive, with a

moderate allowance of wine. When the fomentations and poultices have subdued the activity of the disease, the toes may be dressed with lint and warm water, and kept warm and comfortable with clothing, and on a level with the body. If any of them sphacelate, they ought to be allowed to drop off spontaneously, as they retain life longer than sphacelated parts arising from active inflammation; amputation is inadmissible. This species of mortification, even if cured, is extremely liable to return, to prevent which the diet must be nutritious, with a good allowance of wine, and the feet warmly clothed, in a moderate temperature, and kept as much as possible on a level with the body. Although the calcareous deposit may be said to be peculiar to the old, it has nevertheless been discovered so early as three years of age.

Aneurism.—Aneurism, derived from *ανευρυνω*, consists of several species, the true, false, internal mixed, dissecting, venous, and aneurism by anastomosis. Mr Guthrie makes, besides these, a sacculated, and a mixed false aneurism, and divides the false into a spurious external circumscribed, a spurious external diffused, a traumatic spurious external circumscribed, and a traumatic spurious external diffused aneurism.

True or encysted aneurism, strictly speaking, is a circular or uniform dilatation of the three coats of an artery, and is commonly met with in the arch of the aorta, accompanied with thickening of the serous and muscular coats, and calcareous depositions on the exterior surface of the serous, and not unfrequently atheromatous pulp between that and the muscular tunics. This was first described by Monro primus. Some systematic writers describe two varieties of this, a circumscribed and a diffused true aneurism, which is superfluous. A partial or lateral dilatation of the three coats of the aorta is also sometimes seen, constituting another variety of true aneurism. This and the sacculated species of Mr Guthrie, are nearly the same; the latter of which he defines to be an aneurismal sac, formed upon a preternaturally dilated artery, the walls of which cyst are thinner throughout than usual, and some parts more attenuated, which become dilated, and con-

stitute pouches proceeding from the aneurism itself, and give it a remarkable sacculated aspect. He considers fibrinous coagula an indispensable proof of true aneurism.

The true aneurism of Scarpa, and the majority of systematic writers, consists in a rupture of the serous and muscular coats, with a distension of the cellular, which is produced by the brittleness of the serous tunic when studded with the calcareous or some of the preceding deposits, by absorption in consequence of some of these, by inflammation and ulceration or mortification, by partial dilatation from debility or undue impulsion, by a deposition of coagulated blood, or by a separation of the serous coat. The first of these is found to be the most common cause.

When the three coats are either at once ruptured in consequence of a wound, or the cellular tunic in this true aneurism also bursting, and the blood diffused in the contiguous cellular substance condensing it into a cyst, the disease is styled circumscribed false aneurism, to distinguish it from that in which the blood is more extensively diffused in the cellular tissue even of the muscles, and which is named diffused false aneurism. The former of these is the same as the spurious or traumatic spurious external circumscribed of Mr Guthrie; and the latter, or diffused false aneurism, is the same as the spurious or traumatic spurious external diffused aneurism of this author: The term traumatic indicating that which is produced by a wound.

When the muscular coat alone is ruptured, and the serous protruded through it, the affection is denominated internal mixed aneurism. Venous or varicose aneurism consists in a communication established between an artery and a vein, occurring spontaneously, or from a wound. The dissecting aneurism is that wherein the serous and muscular tunics have a small aperture through which the blood escapes, and separates the cellular from them to a greater or less extent; the blood occasionally joining the stream at a distance by another aperture through the same coats. Aneurism by anastomosis arises from a congeries of arteries and veins forming a vascular tumour. The mixed false aneurism is thus defined by Mr Guthrie: When a true aneurism is formed by a

dilatation of all the coats of an artery, and after attaining to a definite size, suddenly increases at one spot, so as to give the tumour the double appearance of one swelling above another.

Aneurisms occur more frequently in men than in women, the former sex being more subject to those in their extremities, the latter to those in the trunk; and in many individuals it is a constitutional disease: 63 aneurismal swellings, from the size of a filbert to that of a hen's egg, have been detected in one individual. This disease occurs most commonly between thirty and forty years of age, and attacks the irritable, the passionate, the gluttonous, the drunken, the debauched, the syphilitic, the mercurial, and the rheumatic. Coachmen, postboys, postilions, soldiers, particularly dragoons, sailors, porters, labourers, and miners, are said to be most subject to it. These classes of individuals, by indulging in vices, appear to dispose their arteries either to calcareous depositions or to a brittle condition, so that in the violent exertions of their labours, these vessels rupture and form aneurism, in consequence of the circulation being propelled at such times with greater force than the artery has power of resistance; but even in the ordinary circulation of such constitutions, if an artery be weakened, it is unable to resist the momentum of the blood, and therefore gradually yields and dilates. Shocks or contusions, forcible pressure on arteries, the reiterated bruising of parts, the force employed in reducing luxated joints, falls, fractures and wounds, are also causes of aneurism.

The largest artery, the aorta, is most subject to this disease; the next in frequency is the popliteal, then the femoral, the inguinal, the axillary, the subclavian, and the carotid. The smaller arteries, the radial, ulnar, and tibial, are seldom attacked, with the exception of the nutritious artery of the tibia. The reason of this is very palpable, it being chiefly consequent on the impetus of the blood, and the deficiency or delicacy of the adventitious tunics, together with the deficiency of support from the contiguous structures.

Popliteal Aneurism.—When true aneurism occurs in the poples, there is at first a small colourless tumour pulsating

strongly, and containing only fluid blood, occasioning little or no pain, merely some irregularity of the circulation in the limb, with a spasmodic affection of the muscles, which recurs during the night and prevents sleep. On pressing the artery nearer the heart than the tumour, it is easily emptied and divested of pulsation; and on removing the pressure, the aneurismal sac is immediately filled, the pulsation, or *bruit de soufle*, or bellows sound, returns. Gradually as the artery dilates, its powers of resistance are diminished, and the interior of the sac becomes coated with coagulated blood, which is deposited in soft pulpy layers that become firm fibrinous strata, thicken its walls, render the pulsation more and more languid, and also prevent the sac from being completely emptied. Acute pain is felt in the limb, particularly below or distad to the tumour, in consequence of the pressure of the coagulated blood on the nerves; the motion of the fluid in the sac has been compared by the patient to boiling lead. When the cellular tunic of the artery ruptures from over-distension, it is converted from the true into the circumscribed false aneurism. The tumour now nearly solid, there being a faint pulsation opposite the aperture of the vessel, which however may point centrad, and then none is felt. When the cellular cyst forming the limits of this tumour of almost coagulated blood also ruptures, the blood escapes into the surrounding cellular tissue, diffuses itself in all directions, and forms an irregular-shaped tumour, without the least pulsation, and sometimes nodulated. The pressure of the blood benumbs the nerves, impedes both the arterial and venous circulation, particularly the latter, together with that of the lymphatics; the limb feels benumbed and cold, becomes œdematous, swollen, and of a leaden colour, and the joint is impeded in its motions. One or more projecting points of the tumour progressively become thinner from absorption by the pressure of the blood, or the integuments slough and ulcerate, until at last the blood hisses out, and the patient becomes exhausted from repeated hemorrhages, but seldom dies instantaneously. Occasionally, instead of bleeding taking place, and relieving the limb for a time, gangrene supervenes at once, which may demand amputation. Although this aneurism is described as beginning by dilatation of the

tunics of the artery, it much more frequently becomes at once the true aneurism of Scarpa, in consequence of the motions of the knee-joint. Plate III, fig. 4, is a delineation of popliteal aneurism.

The same absorbing or sloughing process takes place when aneurism occurs in the contiguity of the trachea, œsophagus, stomach, and other mucous structures: but when a serous membrane, as the pleura, forms the wall of an aneurism, it is lacerated. When a bone is pressed upon, it becomes carious, or ossific spiculæ are deposited around.

Spontaneous cure.—It occasionally happens that the sac increases in the direction of the artery, presses on it beyond or distad to the tumour, and obliterates its cavity; the sac at the same time becoming entirely filled with depositions of fibrin, which extend into the artery at both ends to the nearest large branches. At other times the tumour compresses the artery above or proximad to itself, producing adhesion of its coats with obliteration of its cavity; in other instances, this proximal portion of the vessel is plugged up with a dense compact bloody coagulum. In these cases, according to the blood effused, does absorption take place, or inflammation suppuration and ulceration, or inflammation and gangrene; and if the patient has strength to support these changes, he is cured of the aneurism, the cure is then termed spontaneous. Besides these, there are other spontaneous processes, one of which is, the aneurismal sac is so coated with fibrous matter, as to resist the impetus of the blood which continues to flow through the original canal of the artery; another is by the sac rupturing, and the blood diffused in the subcutaneous cellular tissue, pressing on the vessel, and ultimately obliterating it. The fibrinous layers of an aneurismal pouch have been found traversed with blood-vessels, and to become ultimately organised.

In the gradual developement of an aneurism, the trunk of the artery becomes diminished in calibre, and the flow of the blood is rendered tardy, thus the blood is forced into the neighbouring small anastomosing branches which become enlarged. This happens particularly if the artery is plugged up. In

some cases, the lateral and central walls of the sac resist the pressure of the blood, while the integuments are too feeble; the latter therefore undergo the changes just detailed under the circumscribed false aneurism. Some aneurisms are exceedingly difficult in diagnosis, especially at the arch of the aorta, subclavian, carotid, and external iliac arteries.

Treatment of Aneurism.—The treatment of aneurism consists in general and local remedies, the former being chiefly applicable to the internal or those situated within the cavities, the latter to the external, or those of the extremities, neck, and exterior of the head.

The general remedies are, abstracting blood in small quantities, confining the patient to bed, keeping him on low diet, and, when the disease is situated in the extremities, the application of a firm compress to the tumour, witha bandage rolled from the toes equally to the groin, or from the fingers to the shoulder. This is also named the palliative, or Valsalva's treatment, from his being the inventor, in whose hands, as also those of others, it has succeeded. Cold astringent applications, even ice, have been recommended. But in aneurism of the extremities, there are many cogent objections to this. In the first place, the patient may be so reduced as to be unable to withstand the confinement after the operation, since, in many cases, it is necessary to remain quiet in bed three or four months, from the dread of secondary hemorrhage. In the next place, if much blood is effused, the absorbents are incapable of removing it, inflammation, suppuration, and ulceration, or gangrene takes place, with great prostration of strength. Thirdly, occasionally great pain is produced by the pressure. This plan, therefore, can only be pursued at the very commencement of external aneurism. For various modes of compression, the reader is referred to the essays and works of Senfio, Freer, Dubois, Sir William Blizard, Deschamps, Scarpa, Seiler, Percy, Duret, Assilini, and Crampton.

Formerly, when this plan of Valsalva failed, amputation was performed, which, however, is now limited to those cases of diffused false aneurism, where the absorbents cannot remove the effused blood, and where extensive suppuration and ulcer-

ation or gangrene must be the result. About fifty or sixty years ago, the surgeons of Italy, emboldened by Haller's doctrine, threw a ligature round the popliteal artery both above and below the sac, which they laid open, and removed the coagula. This extensive wound healed by granulation, or produced sinuses and caries of the bones, with contraction of the joint. Secondary hemorrhage, from securing a diseased artery, was frequent, yet this practice is still followed by many of the French surgeons.

The celebrated John Hunter, perceiving such unhappy results, performed several experiments on the lower animals, and proved that an artery close to an aneurismal sac is so diseased that it must ulcerate; whereas, if secured on the cardiac side between the tumour and the nearest large branch, so as to have the vessel healthy on the one side, and remote enough on the other from the branch, so that the latter would carry the blood on the principle of hydraulics, and leave the tied portion at rest, that a coagulum of blood might take place, and the adhesive inflammation not be disturbed; the operation would succeed in the majority of instances. He also saw, that if this operation were performed early enough, the flow of blood into the aneurismal sac would be so checked as to allow further coagulation, and that ultimately both the blood and cyst might be absorbed. Accordingly, in 1785, he secured the superficial femoral artery for popliteal aneurism, shortly after its giving origin to the profunda; but he employed four ligatures, whereas one is now found sufficient, for which important improvement we are indebted to Freer. This operation has undergone many alterations by Birch, Foster, Freer, Abernethy, Dionis, Richter, Jones, A. Cooper, Travers, Hutchinson, Roberts, Lawrence, Hodgson, and Dalrymple.

The most improved method of securing the superficial femoral artery for popliteal aneurism, is that recommended by Walker, which appears preferable to that of Abernethy, Sir A. Cooper, Hodgson, Sir C. Bell, Shaw, C. Hutchinson, Harrison, Averil, or Malgaigne. To prove the necessity of measurement in this and all other operations for aneurism, the reader is referred to an unusual distribution of the superficial femoral artery, operated on by Sir C. Bell, and described in

Journal of Medical Science, vol. IV.; also to Tiedemann, Barclay, Turner, Harrison, and Lizars' anatomical works.

The patient should be placed on a firm table, with his feet at right angles to each other, but the affected separated from the sound limb. The space between the anterior superior spinous process of the os ilium and the spine of the os pubis is to be divided into ten proportional parts, when five and a half measured from the pubes are made the base of an equilateral triangle, which is to be constructed downwards on the thigh, the apex being distad, the base proximad; and the outer or iliac side of this triangle should be extended from the apex twice its length, when the artery will be found to run beneath this line throughout. An incision should then commence at the apex of the triangle, and be continued down the thigh to the termination of the extended line, or proportionally to the depth of skin and cellular tissue, the latter of which is often infiltrated with serum; this incision is to be deepened equal in length to the first, and should pass through the fascia lata, and this cautiously, when the pulsation of the artery will be felt; the artery is then to be denuded to the smallest possible extent of its cellular sheath; the latter of which is to be held up with the dissecting forceps in the left hand, and the scalpel in the right, with its cutting edge parallel to the vessel, and pointing outwards or fibulad. The operator, seeing satisfactorily the artery, inserts the aneurism-needle, delineated in Plate III., fig. 9, armed with a ligature, on the inner or tibial aspect, between the artery and the vein, and carries it round to the fibular aspect, as depicted in Plate VII., fig. 3, securing the artery with a single ligature of common unbleached linen thread, waxed and tied in the manner of the sailor's reef-knot, Plate IV., fig. 2.; and both ends of the ligature ought to be cut off close to the knot, and the lips of the wound approximated with two or three stitches of the same thickness of ligature. In all instances, before withdrawing the aneurism-needle from the artery, the vessel should be compressed on the instrument by the finger, to ascertain whether the circulation of the aneurism is arrested, or in other words, whether the proper artery is surrounded by the needle, for, as already observed, this, like the brachial artery, is subject to an irregular division. In such

a case, it would be necessary, after securing the one branch, to search for the other, and tie it also. It has been found to run parallel and lateral, and at no great distance from the other. As soon as the wound is stitched, a piece of lint wet with warm water should be applied, and oiled silk laid over it, the patient then should be carried carefully to bed, and the limb laid on a pillow, in an easy attitude. Immediately on incising the skin and cellular tissue, the saphena interna vein is often brought into view, and might be mistaken for the artery; but as it runs superficial to the fascia lata, such a mistake is easily avoided. When the left femoral artery is the subject of operation, the line of the incisions should be reversed; the operator begins at the termination of the extended line, and cuts upwards to the apex of the triangle.

The chief points to be attended to in operations for aneurism, are, making clean free incisions, avoiding tearing and bruising, disturbing or insulating the artery as little as possible, and seeing it distinctly, as also the contiguous veins and nerves if necessary, before throwing the ligature around; and if any nervous threads, as the nervus saphenus, so interfere as to impede the application of the ligature, they should be divided without hesitation. There is great danger of injuring the accompanying vein with the aneurism-needle, and exciting phlebitis.

The surgeon judges of the artery being secured by the tumour becoming flaccid, and divested of pulsation, with a diminution of the pain; and soon afterwards by a strong pulsation of the articular arteries. In the majority of cases, the temperature of the limb is rather higher after than before the operation.

When an artery is thus secured, the ligature divides its muscular and serous tunics, ruptures some of its vasa vasorum, the vessel shrinks, blood, coagulable lymph, or fibrine are effused, and the adhesive inflammation excited, by which its sides and the wound throughout unite. Some days, or even weeks afterwards, I have known it six weeks, the noose or knot thus left behind, induces the most trifling degree of suppuration, the matter of which is chiefly absorbed, and advances slowly, and unfelt by the patient, to the skin, like a plant growing to

the light, and appearing like the smallest possible pimple, is ultimately discharged, the patient frequently not observing it.

Various kinds of ligatures have been invented and used, such as fine silk, inkle, dentist silk, twine, tailor's twist, leaden thread, catgut and other animal matters, but one and all are ejected; consequently that which is smallest in diameter and of sufficient strength is the best, and therefore I prefer unbleached linen thread, waxed. Mr Fielding of Hull, has lately employed silk-worm-gut, and found it to be absorbed; but Dr Crampton lost a patient in consequence of using it.

If the operator should insulate the artery to too great an extent, thus cut off its connexion with the contiguous structures, and destroy many of its *vasa vasorum*, he ought to throw two ligatures round it, each at its extremity of insulation, and divide the artery between them. If he wounds an arterial branch during the operation, it should be secured with a ligature as in ordinary operations. The wound is to be dressed daily with lint and warm water, or the zinc lotion, until healed; the patient to remain quiet in bed, on low or farinaceous diet, until the wound be quite consolidated, avoiding every exertion, for fear of hemorrhage, even in the change of his linens, which ought to be made to slip on and off so as to occasion the least possible movement, and using a urinal and bed-pan when required; four weeks at the very least should be allowed to elapse, before allowing him to sit up in bed, and to have more nourishing food, but even this only provided the wound be healed. The patients of Mott and Graefe, in whom the arteria innominata was secured, evidently fell victims to their being allowed to walk about too early. In such large arteries, and so near the source of the circulation, the patient should be kept horizontal, on farinaceous diet, between three and four months.

Secondary Aneurism.—Not unfrequently a slight pulsation returns in the tumour, which daily increases, and constitutes a secondary aneurism, which may arise either from the inosculating branches between the ligature and the sac, or from others communicating directly with the sac, or thirdly, the blood may retrograde from the inferior or distal aperture of

the artery into the sac. In such an event, we should first try well-regulated pressure and support, as directed for a recent wound of the brachial artery in page 108, together with the general or debilitating plan, and if these fail, secure the artery close above and below the tumour; and if this last fail, perform amputation, but not amputate previously, as recommended by some.

When an aneurism is too large, before a ligature is applied to the artery, it continues to press on the contiguous veins, nerves, and lymphatics, produces gangrene of the foot, and demands amputation of the limb above the aneurism, but not above the point where the artery was secured. This is not an unfrequent result. Gangrene may take place also after the securing of the artery, even however small may be the aneurism, and likewise from a recent wound of the vessel. In these, the mortification ensues in consequence of the inosculating vessels being too few, or too small to carry on the circulation.

Secondary hemorrhage commonly occurs on the 13th day, and should such an event take place, the artery is to be tied either nearer the source of the circulation, in which case the external iliac should be secured, or on the distal aspect, viz. the superficial femoral nearer the poples. In most instances, the bleeding takes place at the lower or distal end of the vessel, because this portion is kept turgid with blood from the inosculating vessels, while the upper or proximal portion is deserted by the blood flowing into the nearest branch of the profunda, as already mentioned in page 95.

Brasdor's Operation.—There is another mode of operating for aneurism, which consists in securing the artery beyond or distad to the tumour, as for example, when the tumour is situated in an artery so near the source of the circulation, that a ligature cannot be thrown round the vessel between the heart and the sac; this was invented either by Brasdor or Desault, and lately practised with success by Messrs Wardrop, Lambert, Bush, and Evans, and advocated by Bichat, Scarpa, Hodgson, and Breschet. This method will evidently succeed, provided there be no arterial branch immediately contiguous to the sac, either on its proximal or distal extremity, and none originating

from the tumour itself to induce the blood to enter the sac; for on applying the ligature, the blood will flow by the anastomosing branches proximad of the tumour, leave that in the sac at rest, which will coagulate and lay the foundation of a cure. Mr Wardrop divides this plan of treating aneurism into two; the second consists in placing a ligature on one of the branches of the diseased artery on the capillary or distal side of the tumour, as for instance, the securing of the right carotid only for aneurism of the arteria innominata.

Aneurism and wounds of tibial arteries.—When either the *anterior* or the *posterior tibial* artery, or even the *nutritious artery* of the tibia, is affected with aneurism in the upper third of the leg, the superficial femoral artery should be secured. When this latter vessel is the seat of aneurism, it is named ossific aneurism; the knee-joint appears the part affected, as it becomes considerably larger than the other knee, is surrounded with varicose veins, and the skin has an erysipelatous tinge; the head of the fibula projects considerably, the leg is bent on the thigh, the voluntary motions are suspended, and there is great pain on moving the joint. On applying the ear to the head of the tibia, there is the *bruit de souflè*, which is checked on compressing the superficial femoral artery, and on removing the pressure the patient complains as if fire were rapidly traversing the knee. As the disease advances, acute pain darts along the course of the external popliteal nerve; the thigh becomes emaciated; the countenance indicates acute suffering, and has the pale yellow tint attendant on protracted pain. The knee now exhibits a swelling on the inner aspect of the patellar ligament, communicating pulsations synchronous with those of the heart; and shortly afterwards another pulsating tumour appears on the outer aspect of the joint in front of the head of the fibula. Dissection exhibits an aneurismal sac filled with fibrinous layers and coagulated blood. The cyst resembles thickened periosteum. This aneurism occurs chiefly in early life, and generally from external violence; it is liable to be confounded with fungous tumours of the periosteum, and medullary sarcomatous tumours.

When the anterior tibial artery is affected with aneurism

in the middle or lower third of the leg, the vessel must be cut down upon, and have a ligature thrown round it immediately above and below the tumour, in consequence of the free inosculation between it and the posterior tibial and fibular arteries; and the same treatment must be pursued when either the posterior tibial or fibular artery is similarly affected. When the anterior tibial artery becomes the seat of operation, the patient should be laid on a low table, with the foot resting on the heel, and the toes turned neither tibiad nor fibulad. An incision proportional to the size of the tumour, and to the part of the leg where the artery is to be secured, and also to the age and muscularity of the patient, is then to be made through the integuments, cellular tissue, and fascia; next cautiously between the tibialis anticus and the extensor pollicis muscles; an assistant now compresses the superficial femoral artery, when the tumour should be opened, unless the artery presents itself; its contents, or coagulated blood, turned out, the upper or proximal orifice of the artery searched for, and the vessel cleanly dissected, when the aneurism-needle is to be carried round, avoiding the anterior tibial nerve and the accompanying veins, and the artery tied. The same steps are to be pursued in securing the lower or distal mouth of the artery. The wound is now to be treated as directed for aneurism at the bend of the arm. The anterior tibial nerve is often an excellent guide to the discovering of the artery as it runs superficially along it. When this artery is wounded in the upper third of its course, a long and deep incision must be made through the integuments, fascia, and between the tibialis anticus and extensor longus digitorum muscles.

The anterior tibial artery, in its course along the dorsum of the foot and toes, is seldom the seat of either the true or false aneurism, but occasionally that by anastomosis, of which Gensoul gives one or two beautiful diagrams, and of which I shall treat hereafter. This vessel, from its exposed situation, is very frequently wounded, but easily secured.

The posterior tibial artery is very seldom affected with aneurism in its two lower or distal thirds, but if so, requires to be treated as if it were recently wounded, which is of no

uncommon occurrence. When this happens, an incision is to be made between the inner angle of the tibia, and the corresponding edge of the gastrocnemius muscle, or tendo Achillis, while the patient lies on his face, with the foot extended, and the toes turned neither tibiad nor fibulad; the incisions are to be carried through the integuments, the superficial fascia, the fibres of the soleus, and the deep fascia, the last of which is to be carefully incised, because the artery lies immediately beneath it, accompanied by its veins and nerve, which, from its whitish colour, often leads to the artery in question. The nerve is to be held aside by a blunt hook, and the aneurism-needle inserted between the nerve and artery. When the posterior tibial artery is wounded in the upper or proximal third of the leg, a very long and deep incision must be made in the central line, between the inner angle of the tibia and the mesial line of the popliteal aspect of the leg, through the integuments, fasciæ, and bellies of the gastrocnemius and soleus muscles, or an incision made between the said central line and the inner angle of the tibia, to avoid injuring the gastrocnemius muscle, which is to be held aside. The deep fascia should be carefully incised; the venæ comites are large, and have numerous inosculations, which obscure the artery; and the nerve lies rather superficial and internal. The plantar arteries in the foot, like the anterior tibial, are subject chiefly to aneurism by anastomosis. When wounded, they must be cut down upon, and secured, however deep, and however entangled with nerves, tendons, and fascia.

The fibular or peroneal artery is seldom aneurismal, but may become the seat of operation in a recent wound, in which case, the position of the limb is the same as that for securing the posterior tibial artery, except the toes turned outwards. An incision should be made along the fibular margin of the soleus muscle, which must be pushed inwards or tibiad, while the tibial edge of the flexor longus pollicis is held outwards or fibulad; the vessel will now be felt pulsating, and the aneurism-needle may be passed round it either from the outer or inner aspect, as there is no nerve accompanying it. The venæ comites are with difficulty separated, unless the artery

be cut across, in which case each end is to be pulled out with the forceps.

Aneurism and wounds of femoral artery.—When the superficial femoral artery is affected with aneurism, which is far from being common, we secure either the common femoral or the external iliac. The former, however, is too short and too contiguous to the internal epigastric and circumflex iliac branches, to render it either an easy or a judicious operation; so short is it, that in some individuals its existence may be questioned, the external iliac having no sooner given origin to the branches mentioned, than it divides into superficial and deep femoral trunks. This artery, the common femoral, therefore, ought only to be secured when recently wounded; the steps to be taken for such are nearly the same as those for the external iliac. To tie the external iliac artery, there are two modes of operating. The first is, having laid the patient on a low table, with the limb extended, and the toes everted, we ascertain its emergence from the pelvis, by measuring between the spine of the ilium and that of the pubis, as in that given for securing the superficial femoral artery; we next calculate the course of the artery from the second last lumbar vertebra to this point of exit. An incision is then to be made over its course, about two inches above or proximad, and two beyond or distad to this point, through the integuments and fascia superficialis to the abdominal aponeurosis and fascia lata, then another incision through the same structures, nearly at right angles, in the line of Poupart's ligament. This ligament is next to be carefully separated by the knife from the fascia lata, and held up with a blunt hook towards the abdomen by an assistant, when the operator cautiously dissects the common femoral artery, retracing its course until he feel or see the pulsation of the internal epigastric and circumflex iliac branches, and then he has arrived at the external iliac trunk, round which he carries the aneurism-needle above or proximad to these branches, from the inner to the outer aspect, and ties it. See Plate VII., fig. 2. The common femoral need not be exposed to any extent; merely enough to feel its pulsation.

The second mode of securing the external iliac artery is, after having calculated its course, to make an incision in the line of the fibres of the external oblique muscle, beginning an inch outwards from the spine of the os ilium, and extending it downwards and forwards towards the pubes, but stopping near the external aperture of the inguinal canal, and carefully avoiding the spermatic cord, as represented in Plate VII., fig. 1. This incision should divide the integuments and superficial fascia; the muscular fibres of the external oblique ought then to be cut through, as also those of the internal and transversalis muscles; the fascia of the latter now presents itself, and requires most careful division, which is best done by pinching it up with the fingers of the left hand, and making a small aperture by a horizontal incision of the knife; the fore-finger of the left hand should then be inserted between the fascia and peritoneum, and the former very cautiously separated, and incised the length of the outer muscular wound by a probe-pointed bistoury. The peritoneum requires next to be raised from its attachments to the iliac or pelvic fascia, until the operator feel the pulsation of the arterial trunk, when, an assistant keeping out of the way the peritoneum enveloping the intestines, the operator clears the artery near to its giving origin to the internal epigastric and circumflex iliac branches, and inserts the aneurismal needle on the pubic aspect, keeping in view its accompanying vein. The ilio-scrotal nerve generally descends on the artery, and requires to have a blunt hook round it, to keep it aside. The vessel ought lastly to be secured with the same linen ligature as that for the superficial femoral, the muscular and cutaneous wounds next carefully stitched, in case of the peritoneum being involved. This artery has been frequently tied with success. In the diagram, Plate VII. fig. 1., the operations for securing the three iliac arteries are represented, therefore the reader must keep this in view, when examining it as relates to that for tying the external iliac alone. He is also referred to the explanation of the plates.

Aneurism of gluteal artery.—The internal iliac artery has also been often successfully tied for aneurism of the ischiadic

or gluteal arteries. The preliminary steps are nearly the same as those for the external iliac. The incision requires to be extended more around, parallel to the crista of the ilium, and less towards the inguinal canal; the spine of the ilium ought to form the centre of it. The peritoneum must be raised still more from the iliac fascia. The pulsation of the external iliac is first felt, and this artery retraced upwards until that of both the common and internal iliac vessels be distinguished; the operator then carries the aneurism-needle cautiously round the internal iliac artery, keeping close to it to avoid wounding the vein. See Plate VII., fig. 1.

Aneurism of external iliac artery.—The common iliac artery has been several times secured for aneurism of the external iliac, but only once with success; it has also been for a recent wound unsuccessfully. The same steps are here required as those for the preceding artery; when the operator has satisfied himself regarding the pulsation of the external and internal iliac vessels, he cannot err in throwing the ligature round their trunk. The needle is to be passed from the pelvic to the outer side, carefully carrying it round to avoid wounding the vein, see Plate VII., fig. 1. These three arterial trunks occasionally proceed deeply on the pelvic aspect of the psoas magnus muscle, which would be liable to embarrass the operator.

Aneurism of the external iliac artery is with difficulty distinguished from medullary tumour in its vicinity; to my knowledge, more than one patient has been sacrificed by ignorant and opinionative operators.

Operation for abdominal aorta.—The abdominal aorta has been twice secured for hæmorrhage, but unsuccessfully. Should the operator consider himself justified in this operation, an incision should be made parallel to the linea alba, on the left side of the umbilicus, sufficiently extensive to enable him to keep aside the small intestines, which are to be transferred to the right side, while he cautiously dissects the peritoneum interposed between the knife and the artery. Several nervous threads of the aortic plexus require to be divided. The aneurism-needle

should be carefully inserted between the vena cava ascendens and the aorta, and be carried around from right to left. The lumbar branches should be kept in view, so also may the inferior mesenteric. The wound of the abdominal parietes requires to be carefully united by the interrupted suture in all of these operations, since the individual is very liable to labour under ventral hernia ever afterwards. Those who had the internal iliac artery secured, were so afflicted.

Recent wounds of pelvic arteries.—The gluteal, ischiadic, and internal pudic arteries, are now only secured for recent wounds. When the gluteal is the subject of operation, the surgeon should keep in view its point of emergence out of the pelvis, which is ascertained by placing the patient on his face, extending the limb, and turning the toes inwards or tibiad; next drawing a line from the posterior-superior spinous process of the os ilium, downwards between the tuberosity of the os ischium and the trochanter major, and dividing it into three proportional parts, when the artery will be found at one third from the spinous process of the ilium, and two from the centre of a transverse line extending between the mesial of the tuberosity, and the inner or tibial edge of the trochanter. The depth is considerable through the gluteal muscles, so that a long incision is requisite.

When the ischiadic is wounded, it is found by keeping in view nearly the same measurement, and taking the centre of the line from the spinous process of the ilium to the tuberosity of the os ilium. The great sciatic nerve runs close to this artery.

The internal pudic artery can scarcely be wounded except in lithotomy; and if so, it requires an extension of the external incision towards the ramus of the ischium, and the division of the obturator portion of the pelvic fascia, when either its bleeding mouth will be seen, or its pulsation felt, and then it can be secured either with the forceps or aneurism-needle. If the latter instrument be employed, the artery should be carefully separated from its accompanying nerve.

Brachial aneurism.—The brachial artery at the bend of the

arm is probably the most frequent seat of aneurism, in consequence of its being wounded in blood-letting, which is often performed by ill-educated medical men, midwives, nurses, and blacksmiths. The aneurism which follows is either the circumscribed false, the diffused false, or the venous. The first is the most common, and the tumour is about the size of a pullet's egg. It should be treated like a wounded artery, by securing the vessel on each side of the wound. The patient should sit on a chair, with his arm gently extended on a table, his hand supinated, with a pillow for a cushion to rest on. One assistant should hold his hand, and another be prepared to compress the artery. The surgeon then makes an incision over the tumour cautiously through the integuments, extending it a little above and below, so as to bring into view a little of the artery where it enters and emerges; the assistant now compressing the trunk in the middle of the arm, the operator incises freely the aneurism, removes its contents or coagulated blood, searches for the upper aperture, and dissects the vessel, proximad or above, merely enough to carry the aneurism-needle round it from the inner to the outer aspect of the arm, carefully avoiding the median nerve and the concomitant veins. If any difficulty exist in finding the upper aperture of the vessel, the assistant should remove the pressure, when a jet of arterial blood will direct him. The same steps are to be taken to secure the lower or distal aperture of the artery, and the long ends of the ligatures must be cut off. The wound may now be either gently filled with lint, or have its sides approximated with one or two stitches, and lint wet with warm water applied. This wound must suppurate, so that in two or three days, poultices may be substituted for the wet lint.

Venous aneurism, named also varicose aneurism, and aneurismal varix, occurs commonly at the bend of the arm from venesection, but has occurred to the subclavian artery and vein, the popliteal artery and vein, the common femoral artery and vein, and the posterior tibial artery and vein, from punctured wounds of these vessels, and even spontaneously to the arch of aorta and vena cava descendens, and abdominal aorta and vena cava ascendens, and other vessels lying contiguous to one another.

In this disease a communication is established between the artery and vein, by which the arterial blood flows directly into the cavity of the vein. When it takes place at the bend of the arm, inflammation is excited at the wounded points of the vein, the fascia of the biceps and the artery forming a bond of adhesion between them and a passage for the blood. A tumour is soon formed of a delicate bluish colour, which pulsates like an artery, and communicates a tremulous motion to the touch, and rustling noise to the ear, somewhat resembling the hissing noise of air ejected from a syringe, and occasionally so loud during the night, as to prevent the patient sleeping. The pulsation is only distinct in the centre of the tumour, and occasionally the contiguous veins are more or less varicose. The artery above, or proximad to the tumour, becomes larger, and vibrates strongly, while below it is smaller. If the tumour be emptied, and sufficient pressure be applied above, to check the cutaneous venous circulation, it will immediately fill; but if the pressure be enough to compress the brachial artery, the tumour will diminish. This species of aneurism appears sometimes within three or four hours after venesection, while at others not for several weeks; it has a circumscribed form, is about the size of a walnut, with the cicatrix made by the lancet in the centre. It increases very slowly, excites little pain, producing more a sense of weight, numbness, and feebleness of the arm; and is the least dangerous of aneurisms, never rupturing the skin spontaneously, but being liable to be converted into the false, with which it is sometimes complicated. The treatment consists in the application of compression and bandage, wearing the arm in a sling, or keeping it horizontal; or, lastly, in securing the artery, which, from its being the shorter means of cure, is the best remedy.

When we secure the artery in this venous aneurism, we should not open the tumour, but dissect the artery on the one side or other of the venous swelling, above and below, or proximad and distad of the aperture of communication, and then pass the aneurism-needle round the artery close to its wound on the distal aspect, and secure it with a ligature; and next do the same on the proximal aspect. The reason we should not open this tumour is, that it is a distended vein with

fluid blood, and veins we have seen to be easily excited, and their inflammation dangerous indeed; besides, it would embarrass, not facilitate, the operation. The reason why we secure the distal portion of the artery first, is to enable the surgeon still to have the pulsation of the vessel to guide him to the proximal portion. An assistant must, as in the preceding operation, be ready to compress the artery, lest he should wound the vessel.

Compressing an artery.—Compressing an artery with the fingers, is now preferred to the tourniquet, and is easily done if the assistant is acquainted with anatomy. When the brachial artery requires compression, the assistant should stand behind the patient and surround the arm with his two hands, placing his thumbs on the artery, the one above the other, see Plate XII. fig. 3. He ought to feel the vessel pulsating, and gradually apply the pressure until it cease to beat, and then keep up this degree of compression, provided there be no bleeding as the operation proceeds; for if such should occur, it would naturally be necessary to apply still more pressure.

Wound of brachial artery.—When the brachial artery is wounded in blood-letting, there are two modes of treatment; the one, to cut down upon the vessel at once, and throw a ligature on it immediately above and below the aperture; the other, to apply graduated compresses wet with cold water over the wound, to bandage each finger separately, and next the hand and fore-arm upwards to the compresses, then an oblong compress of lint and wood along the brachial artery, from the compresses upwards four inches towards the axilla, lastly, continuing the bandage or roller over this to the axilla. The patient to remain quiet in bed for three weeks with his arm elevated and laid on a pillow, and enveloped in flannel, and having a ring tourniquet applied near the insertion of the coraco-brachialis muscle.

Of these two modes, I prefer the first, because the operation is simple and successful; while the second frequently fails, and then, after a tedious confinement to bed, the same operation is still required.

All wounded arteries ought to be secured at once, and in the same manner.

Aneurism and wounds of arteries of fore-arm.—When either the radial, the ulnar, or the interosseal artery becomes the seat of aneurism, it should be treated as directed for the brachial artery.

When the radial artery requires to be secured for a recent wound in its upper or proximal third, the position of the fore-arm, and that of the patient, are the same as for the brachial; while an assistant compresses the brachial artery, an incision from three to four inches is made nearly in the centre of the fore-arm, over the wound, along the ulnar margin of the supinator radii longus muscle, through the integuments to the fascia; which latter is then to be cautiously incised to the same extent, and the muscle carefully separated from its connexion with the pronator teres muscle. The artery is now to be searched for, and if any difficulty exist, let the assistant remove the pressure, and the jet of blood will indicate the wounded vessel, which is to be cleanly dissected from its connexions, if the artery be not divided, and the aneurism-needle inserted on its radial aspect, to avoid the cutaneous branch of the radial nerve, which is sometimes close to it, and also as far as practicable, its concomitant veins. The ligature to be tied in the manner of the reef-knot. The same steps are to be pursued in securing the lower or distal portion. When the artery is divided across, its upper open mouth is pulled out with the forceps, Plate III., fig. 6., and separated, to a small extent, from the surrounding tissues, with the fingers of the left hand, when an assistant throws a ligature round it, and secures it with the reef-knot. The same is to be done to the lower open mouth.

When the radial artery is wounded in the two lower thirds of the fore-arm, it is to be found running between the supinator and the flexor carpi radialis muscles. The tendons here form an excellent guide. When wounded as it passes round the thumb, the extensor tendons should be carefully preserved. When wounded between thumb and fore-finger, on the palmar aspect of the hand, it becomes difficult to secure, and requires

free division of the muscles. For a badly managed case of this accident, the reader is referred to Johnson's Medico-Chirurgical Review for 1828, page 435.

The accompanying veins of such small arteries generally so entwine round them, and have so many short inosculating branches, as not to admit of being separated without a protracted dissection, and therefore had better be included in the ligature, when the artery is affected with aneurism, or has only a small wound, and not divided across. Veins ought to be separated in every operation, if possible, in a short space of time.

When the ulnar artery is wounded in the upper or proximal third, the position of the fore-arm and that of the patient are the same as for the brachial, and an assistant compresses the latter vessel as therein directed. A deep incision is then made immediately over the ulnar artery, through the integuments, fascia, pronator teres, and flexor muscles, until the median nerve appear, when the vessel will be found behind it. Sometimes a few muscular fibres intervene. Or, an incision may be made between the flexor carpi ulnaris and flexor digitorum sublimis muscles, the ulnar nerve brought into view, when the artery will be found a little to its outer or radial aspect, with the median nerve running superficially. The same steps are to be taken as directed for the radial artery in the same part of its course.

When this artery is wounded in the two lower thirds of its course, it is readily found descending between the flexor carpi ulnaris and the flexor sublimis muscles, having its nerve on the outer or ulnar margin, but occasionally superficial. When wounded in the palm of the hand, an event which frequently happens in drawing the cork of a bottle, the vessel must be secured, preserving as far as practicable the palmar fascia and the nervous threads.

Aneurism and wound of brachial artery.—The brachial artery, between the axilla and the elbow-joint, is now secured only when recently wounded, in consequence of the frequent high division into radial and ulnar, and the free inosculation between its branches. When wounded, it is

readily discovered in its course along the inner margin of the coraco-brachialis, or biceps muscle, and should be carefully separated from the median nerve, and its venæ comites, before the ligatures be applied.

When affected with aneurism in this course, the subclavian artery, as it emerges between the scaleni muscles, and runs over the first rib, should be secured, because the division alluded to has taken place in the axilla, and because the axillary artery is so deep, so encompassed with the axillary plexus of nerves, so obscured by its accompanying vein and the cephalic, and gives origin to so many branches, that it ought only to be tied in the event of its being recently wounded.

To secure the subclavian artery, the patient should be laid on a low table, with his shoulders gently raised, the affected arm held close to his side, with the shoulder brought round towards the sternum, and the face turned away from the seat of operation. The operator should stand between the head and shoulder of the patient, and make an incision in the neck through the integuments, superficial fascia, and platysma myoides, from near the scapulary to the sternal end of the clavicle, keeping free from the bone. The deeper incisions should extend only between the margins of the trapezius and sterno-mastoid muscles, the latter of which, where it arises from the clavicle, is a guide to the vessel. He ought now to dissect cautiously, with the scalpel and forceps, the cutting edge of the former pointing to the occiput, feeling from time to time for the pulsation of the vessel, and looking earnestly for the vein, until he arrive at the artery, which is to be rendered clean and distinct. The aneurism-needle is then to be inserted between the artery and the vein, and passed carefully around to exclude any of the axillary plexus of nerves. The ligature, after the first noose has been made, is to be twisted round the middle fingers, while the fore-fingers are pressed down into the wound to tighten it, and then the second noose made in the same way; and thus all *serres-nœuds* are superseded. Various fanciful instruments have been invented for the simple aneurism-needle in this operation, by Desault, Deschamps, Ramsden, Watt, Earle, Prevost, Jacobson, Mott, Weiss, &c.

While feeling for the pulsation of the artery, during this

operation, we generally touch the tubercle of the first rib, which is a sure guide to the vessel, as it runs immediately outwards or scapulad. The scalenus anticus muscle, which is attached to this bone, is also an excellent index.

Wounded Axillary Artery.—When the axillary artery is wounded, the pectoral muscles must be freely incised, and the vessel carefully separated from its veins and plexus of nerves. Some of its branches, as the superior thoracic, are necessarily wounded in this dissection, and will require ligatures, but not until the trunk shall have been secured. The arterial trunk runs close to the coracoid process of the scapula, and the inner margin of the coraco-brachialis muscle.

Wound of subclavian artery.—The subclavian artery, unless recently wounded or affected with hemorrhage consequent on operation, should never be secured nearer the heart than at its scapulary emergence between the scaleni muscles; for on the right side the arteria innominata can be tied; while on the left side, from its origin to its entering between these muscles, the thoracic duct and great sympathetic nerve forbid all surgical interference, besides the pleura, the pneumogastric nerve, the large branches from the subclavian itself, and the important contiguous veins. From the fatal result of the cases wherein the arteria innominata has been secured for aneurism of the subclavian, the propriety of attempting it now is very questionable; for hemorrhage took place in each from the subclavian artery, this being distended with blood from the hour of operation, by the free inosculation of the vertebrals and internal carotids. The same must be the event even if we throw a ligature round both the right carotid and right subclavian, the former two inches from the innominata to allow a coagulum to form, and the latter at its very origin, the only point of deligation.

If the operator, however, considers himself justified in throwing a ligature round the innominata, let him place the patient on a low table, with his head on a thin pillow, and turned neither to the right nor to the left side; let him next stand at the head, and make a long cutaneous incision from an inch or so

over the sternum to four or five inches upwards along the tracheal margin of the right sterno-mastoid muscle. He should then cautiously divide the fasciæ of the neck, any fibres of the platysma myoides, the sterno-hyoid and sterno-thyroid muscles, the two latter with the scalpel held horizontally towards the trachea. The pulsation of the origin of the common carotid artery will now be felt, and this vessel is to be traced downwards until the pulsation of the right subclavian be also distinguished, when the source of both, the arterial trunk in question, will be seen beating, and which lastly is to be carefully cleaned. The aneurism-needle is to be carried from the thoracic to the cervical aspect, keeping close to the vessel not to wound the pleura. See Plate V., figs. 1. and 2. When the ligature is tightened in this operation, the patient has a burning sensation in the site of the heart, probably from its proximity.

Aneurism and Wound of the Carotid Artery.—The carotid artery has been often secured for aneurism at its bifurcation, and it, or one of its branches, becomes frequently the seat of operation in suicidal cases. The diagnosis of this aneurism requires attention, because there are cases where aneurism of the arch of the aorta has been mistaken for it; besides this, an abscess, an enlarged lymphatic gland, thickening of the cellular tissue, or an enlarged thyroid gland, has simulated this aneurism. If an aneurism, we should be able to feel its pulsations in every direction, and also on removing it from its connexions; it ought not to follow the motions of the larynx like the thyroid gland, and we ought to be able to distinguish the pulsations of the healthy artery nearer the heart.

When we tie the trunk for aneurism, we place the patient in the same position as for the arteria innominata, but with the face turned to the side opposite to that on which the operation is to be performed; see Plate IV., figs. 1. and 3.; and draw a line across from between the thyroid and cricoid cartilages to the margin of the sterno-mastoid, then make an incision along the tracheal margin of this muscle two inches on each side of this transverse line, through the integuments,

superficial fascia, platysma myoides, to the marginal fibres of the sterno-mastoid, keeping in mind, that an anterior external jugular vein may be present. The operator must now, with the cutting edge of the knife towards the larynx, lay open cautiously the deep fascia, then the artery will be observed pulsating; here the superior thyroid or laryngeal vein often crosses the vessel. It is next to be carefully cleaned on its outer or dermal aspect to the smallest possible extent, holding aside the descendens noni nerve with a blunt hook, or dividing it at once, and then the aneurism-needle inserted between the internal jugular vein and the artery, keeping close to the latter to avoid the pneumo-gastric and great sympathetic nerves; the former lies on the posterior or dorsal aspect between the artery and the vein in the same sheath, the latter behind or centrad to the artery and exterior to the sheath, but so close, that I have often seen it included in the ligature when performing this operation on the dead body. The securing of this trunk does no harm to the functions of the brain; even both carotids have been tied in the same person.

When the carotid requires to be secured nearer its origin, the directions given for tying the innominata are applicable.

Operations for securing the external carotid artery, and its branches.—The external carotid artery is to be reached by placing the patient in the same position as that for the common trunk, then an incision is to be made along the inferior border of the posterior belly of the digastric muscle, nearly its whole extent, proceeding through the integuments, superficial fascia, and platysma myoides, avoiding the external jugular vein, until the fibres of the digastric appear. The line of incision should now be at right angles, with the edge of the knife towards the chin, keeping the angle of the jaw as a guide. A few scratches with the scalpel will bring the artery into view, which, when cleaned, is to be encircled by the needle from the dorsal to the mesial aspect. A lymphatic gland often obscures the vessel.

The conjoint trunk of the temporal and internal maxillary arteries can be secured in the same way, but the upper margin of the digastric muscle is then made the guide, and

which should be pulled gently downwards by a blunt hook. The parotid and submaxillary glands, and a greater number of veins, interfere in this than in the preceding operation.

The lingual artery is frequently the seat of operation in suicidal cases, and when deemed prudent to excise the tongue affected with carcinoma. The position of the patient is the same as that for tying the common carotid. An incision is to be made along the upper margin of the os hyoides, until both it and the posterior belly of the digastric muscle be brought into view, when blunt hooks are to be put round each, and the muscle pulled gently upwards, and the bone downwards. The hypoglossal nerve should now be visible, and it also is to be hooked upwards, then a few scratches through the hyoglossus muscle along the upper border of the hyoid bone will bring the artery into view, which is to be secured.

Aneurism of Arteria Innominata.—When the arteria innominata, or any artery, becomes affected with aneurism, and it is impracticable to place a ligature between it and the heart, Desault proposed the securing of the vessel between the tumour and its remote branches, which mode of treating this disease is now proved to be equally efficacious with the former: for this operation, however, to be successful, there must be no branches, originating from the artery, between the aneurism and the point of deligation, (although some cases have succeeded, even when such branches did exist,) because in aneurism the securing the arterial trunk nearer the heart, merely renders the circulation more sluggish in the tumour, thus favouring the coagulation of the blood already begun, and plugs up the vessel. See pages 95. and 99.

The diagnosis, when the arteria innominata is the seat of aneurism, is very difficult. See Mrs Denmark's case, in Wardrop on Aneurism. I have seen experienced stethescopers deceived. We must be satisfied in being able to trace the pulsations of the arch of the aorta, that they are free from the *bruit de soufflè*, and that this sound emanates from the diseased innominata. Let the reader consult Burns on the head and neck, and also Pattison's edition of the same, as well

as Wardrop on Aneurism, and he will be convinced of the difficulty.

In aneurism of the arteria innominata, we throw a ligature round either the right carotid or right subclavian artery, and whichever pulsates the more feebly should be preferred. If both are equally strong in pulsation, a preference should be given to the carotid.

The superficial femoral artery was first secured by John Hunter; the brachial by Anel; the carotid by John Bell or Hebenstreit; the gluteal by John Bell; the external iliac by Abernethy; the subclavian by Ramsden; the internal iliac by Mr Stevens; the common iliac by Gibson of Baltimore; the arteria innominata by Mott; and the abdominal aorta by Sir A. Cooper.

Aneurism by anastomosis.—Aneurism by anastomosis, named also nævus maternus, tumeurs variqueuses, or fongueses sanguines, tumeurs erectiles, hæmatoncus, blood-sponge, and in common language, strawberry or raspberry tumour, begins usually at birth, having the appearance of a red, purple, or livid stain, but occasionally there is a distinct prominent vascular tumour as delineated in Plate V., fig. 3.; in some cases, the disease remains long dormant, while in others, this vascular plexus of vessels increases, distending the skin, which ruptures in sultry weather, or in intense cold, producing hemorrhage, which becomes each time more alarming, until it prove fatal. This is particularly the case when it attacks a surface delicately covered with integuments, as the lips. It is more frequently situated about the head than elsewhere, sometimes quite flat, and involving a great extent of surface, as the lips, mouth, fauces, pharynx, neck, and chest; and the same vascular plexus has been discovered within as well as without the cranium, the capillaries of the dura mater being equally affected. This disease has occurred in the adult, from accidental violence, beginning in the form of a mere pimple or speck, and soon becoming a throbbing incontrollable vascular tumour, bleeding on the slightest exertion, drinking, mental emotion, exposure to the sun or cold. In infancy, this disease must be distinguished from the congenitæ notæ, or

growths of hair, &c. John Bell, who first correctly described this tumour, conceived there were cells intermediate to the capillary arteries and veins, in which opinion he is joined by Dupuytren and Wardrop; but, from what has been detected in careful injection and dissection of such tumours, and what is developed in the spleen, placenta, corpus cavernosum et spongiosum penis, especially the latter in the elephant, no cells exist in these tumours, but the delicate veins form large and frequent anastomoses, which, from communicating freely with one another, and adhering together, resemble cellular tissue. Plate VI. fig. 3, copied from Gensoul, is a representation of the arteries of the fore-arm affected with this disease.

In young children, when the tumour is very small, and before they have been vaccinated, it has been cured by inducing adhesive inflammation with vaccine lymph, and obliterating the blood-vessels; but this fails when the tumour is of the size of a cherry. Vaccination, therefore, ought to be confined to the flat congenita nota, or nævus maternus. Compression may next be tried, particularly if the tumour is situated on the face. I have seen it succeed when on the forehead, between the eyes, and on the cheeks. In one of these cases, Mr James Fortune, an able mechanist of this city, contrived a light compressor somewhat of the shape of a crown.

The third mild mode of treatment, and equally efficacious with any of the others yet to be described, is Fawdington's of Manchester, which consists in inserting one or more seton cords beneath the tumour, while the latter is raised with the fingers of the left hand. Care must be taken that the cotton cords be larger than the needles employed, to prevent hemorrhage, and for the same reason they should be completely under and free from the tumour; in this relative situation also, they will be more likely to cause obliteration of the vessels leading to the tumour, for when passed through the diseased mass, the vessels leading to it very rapidly reproduce that which has been destroyed. These cords should be allowed to remain until the tumour have a dull appearance, have shrunk, and seem to be consolidating. They ought to be reduced in thickness, whenever suppuration is abundant, to allow the pus freer exit, and to moderate the irritation necessarily in-

duced; this, however, is so mild, that setons may be employed in children one month old, and hence their superiority to the other remedies to be described.

The fourth mode, first recommended by J. Bell, consists in inserting a needle armed with a strong double-waxed ligature under the tumour, and tying first the one thread round the half of the root of the swelling, and then the other thread round the remaining half; thus strangling its circulation. As this frequently excites convulsions, it cannot be practised earlier in life than three months, but even after this age it has induced these symptoms and proved fatal. A modification of this plan, followed by Mr Liston, is the inserting more than one ligature, and tying two and two together; and another modification pursued by that able surgeon, is first making a crucial incision over the tumour, dissecting back the flaps, and then passing the ligatures.

Each of the above modes of treatment fails, when the vessels forming the diseased mass originate from a cavity, for example the nares, the antrum maxillare, the cranium, and the pelvis.

The securing the arteries leading to the tumour has been successful, but has failed, too, even in the most scientific hands. The extirpation of the tumour is objectionable in early life, because we require to cut at some distance from the tumour, to avoid the blood-vessels, thus leaving a great extent of surface to granulate and cicatrize, and causing considerable deformity, if the seat of the disease is the head or neck. Potassa, or kali purum, applied so as to produce gentle ulceration and sloughing, has succeeded, but it is only advisable in very small nævi materni, since it has proved fatal even in Boyer's hands. Potass is sometimes necessary to be applied at the termination of one of the preceding modes, if a small portion of the tumour has escaped destruction.

A sixth mode of treatment consists in making a number of punctures with a couching needle from one orifice in the skin, and in a radiating form across the tumour. A seventh mode is the injecting of the cellular tissue round the plexus with diluted nitric acid, of the strength of from 3 to 6 drops of the acid to a drachm of water.

DISEASES OF THE VEINS.

Under blood-letting we have seen the proneness of the veins to inflammation, and its fatal tendency; and under ulcers with varicose veins, the impropriety of securing them with a ligature. The uterine, the crural, the external, the internal, the common iliac, and spermatic veins, even onwards to the renal and vena cava inferior veins, have been found inflamed, thickened, and filled with purulent matter and lymph, after abortion, ordinary accouchement, and in puerperal fever. The crural veins have been found in the same diseased condition after injuries and amputation, and those of the neck after injuries of the head; and the right lateral sinus of the brain from inflammation of the ear. In many of these fatal cases, there has been pus not only in the veins, but in one or more of the distant organs of the body, especially in the lungs and liver, this secretion being either on their serous surfaces, or in their parenchymatous tissue. This deposit is ascribed to metastasis, and if so, it is natural to think that it originates from one of these organs being more delicate than the rest; just in the same way as when fever attacks an individual predisposed to pulmonary consumption, his lungs suffer most. Similar appearances have been seen in phthisis pulmonalis, and in carcinomatous affections of several organs. A greyish coloured fluid has been found in the splenic and hepatic veins. Inflammation in veins, although rarely, sometimes terminates in ulceration, producing hemorrhage, and commonly begins in the serous tunic; the adhesive inflammation, however, more frequently obliterates their cavities, and prevents hemorrhage. In ulceration of the pharynx and rectum, the veins occasionally bleed profusely and even fatally, while in phthisis pulmonalis they are commonly plugged up with lymph. And when sphacelation occurs in the vicinity of veins, they become plugged with coagula of blood, as already mentioned under mortification. In cramps, cold stage of ague, violent exertions, and blows, the veins are sometimes lacerated.

The veins, from gravity or pressure, frequently become

varicose, or present a serpentine swollen knotted appearance, on the lower extremities, the spermatic cords and scrotum, the spermatic plexus of the ovaria, the rectum especially at its termination or round the anus, and occasionally on the integuments in the hypogastric and inguinal regions; the veins of the neck and upper extremities are seldom affected. When this varicose condition is in the leg, it is generally confined to the superficial veins, though sometimes the deep-seated are involved. This disease is now and then congenital. In many of these, especially the cutaneous of the leg and the hemorrhoidal veins, coagula of blood, obliterating the cavity, have produced a cure. The veins are also subject to circumscribed distension or dilatation, varying in size from a small nut to a pigeon's egg, but sometimes to such an extent as to rupture and prove even fatal. M. Briquet makes three varieties of varicose veins. These distensions are occasionally accompanied with pain, and, when situated superficially, sometimes with inflammation and suppuration of the skin and cellular substance in their vicinity, forming ulcers.

The treatment of varicose veins consists in affording them support, or obliterating them with potassa. The saphena major and minor of the leg, when affected, require the roller to extend from the toes to the groins, and are much benefited by being bathed with a decoction of oak bark, and attention to the bowels. When potassa is used, from three to five grains are applied according to the thickness of the integuments, above or proximad to the varicose portion of the vein, and retained with a dossil of lint and bandage for eight hours, next the part is to be poulticed until the eschar fall off, and then the ulcer dressed simply. The effect of the potass is to produce an eschar on the skin, by which the vein inflames, the blood coagulates, effusion of lymph follows, with an adhesion of the sides of the vein, thickening of its tunics, and consequent obliteration of its canal. When we apply potass to a patient advanced in life, there is little or no excitability in the vein, lymph is with difficulty secreted, and hence hemorrhage is to be dreaded. He must therefore be kept confined to bed, and watched during the separation of

the eschar, which is naturally very slow; and if hemorrhage take place, a compress of lint and bandage are to be applied and kept on for three days at least. I have only seen one instance of this among many, thus treated. In another case, where eschars were made in both legs, slight phlebitis supervened.

The potass is milder and more manageable than the actual cautery recommended by some writers.

The throwing a ligature round a varicose vein has been so frequently fatal that it is now abandoned; even Mr Liston's modification appears objectionable. This consists in passing a long fine needle under the vein, and applying the twisted suture; the needle is withdrawn within two days, or as soon as condensation of the surrounding tissues and coagulation in the vein to some extent have ensued, and before any ulcerative process has been set up for the detachment of the foreign body.

Incision and excision have been likewise so often fatal that they are relinquished; even Sir B. Brodie's modification of incision appears hazardous. This consists in inserting a narrow sharp-pointed bistoury through the integuments on one side of the vein, and carrying it between the skin and the vein to the opposite side, and dividing the vein on withdrawing the instrument at the same wound of the skin. The knife is held flat while it is passed between the skin and vein, and its cutting edge turned to the vein on its being withdrawn. The varicose state of the spermatic and hemorrhoidal veins will be treated of under diseases of testis and rectum.

The veins, like the arteries, have been found cartilaginous and studded with calcareous depositions, and in their cavities loose calculi, named phlebulites. In some cases the same diseased structure as that in the vicinity, as, for example, medullary and carcinomatous sarcoma, have been found growing from the serous tunic of veins. The largest veins of the system, even the vena cava inferior, have been obliterated, and the circulation carried on by the superficial ones, and the vena azygos. Veins are now found to be subject to the same diseases as the arteries.

HEMORRHAGE.

Hemorrhage, from αιμα and ρηγνυμι, the dread of both the ancients and moderns, has greatly retarded operative surgery, and precisely in proportion to our ignorance of anatomy. When an artery is wounded, the blood of a bright vermilion colour flows in distinct jets, while, when a vein is cut, it flows of a dark purple colour, in an equable or smooth stream. In the smaller veins contiguous to the capillary arteries, the stream is interrupted, or flows *per saltum*, as if an artery were wounded. When an artery is merely punctured, the hemorrhage generally soon produces fainting, and the blood injects its cellular sheath, which forms a coagulum that becomes a temporary barrier to its flow; but if this process be disturbed, or if inflammation and ulceration follow, the hemorrhage will recur from time to time, until it prove fatal. In such cases, therefore, if the vessel is large, as that of the thigh, it should be instantly secured by throwing a ligature around, above and below the seat of the wound, because the retrograde flow from the free inosculation is liable to reproduce the bleeding. But if no disturbance accrue to this process of nature, and even if the artery have a small longitudinal or obliquely incised wound, the wounded edges of the artery inflame, effuse coagulable lymph, and are united by the adhesive inflammation; and if the wound is small, the continuity of the vessel is preserved. A long continuance of rest is requisite, however, to ensure safety from aneurism. I saw the brachial artery wounded by a dresser in the Royal Infirmary, where the arm was instantly compressed and bandaged most scientifically, but four days afterwards, the patient died of the affection for which she was bled, and on examination, there was an elegant little aneurism. The preparation is preserved. It will be at once seen, that the same causes preventing the success of securing the principal artery of a limb for aneurism, will operate here, and that mortification will be even more liable to follow in this case.

When an artery is divided transversely, an impetuous flow of blood takes place, producing fainting; its ends are constrict-

ed, and retract into the contiguous cellular tissue, which is injected with blood that soon coagulates, while the blood flows by the proximal branches, allowing a coagulum of blood to take place in the trunk, which thus gradually becomes obliterated, as if secured in aneurism, and thus the hemorrhage is for a time arrested. If this natural process be undisturbed, slight inflammation will follow with the effusion of coagulable lymph in the artery, between its coats, and in the cellular substance in the vicinity, which becomes gradually consolidated, and proves a perfect barrier to after bleeding. This, however, is not always the case; particularly if a branch is near the wound, the blood flows impetuously by the trunk, produces fainting, which recurs at each successive rallying of the system, or at once proves fatal. The artery ought therefore to be secured, as in the first instance, even were it the axillary, in its mesh of nerves, veins, and branches. This vessel was lately wounded with a sharp-pointed instrument, and the subclavian, as it runs over the first rib, tied, and compression applied, with success, by Langenbeck. When an artery is torn across, as for example, when the arm is wrenched off at the shoulder by machinery, there is little or no bleeding, in consequence of the twisting or torsion of the coats of the vessel, the muscular and serous are lacerated, and shrink within the cellular, and the blood coagulates between them, forming a large firm clot, which stems the hemorrhage. I have now seen two cases illustrative of this, in boys about twelve years of age. The one had his arm torn off within an inch or so of the shoulder-joint; the other, the whole of the scapula, with two-thirds of the clavicle. In both, the artery was seen beating strongly in the centre of an extensive and clean wound, with a long dark clot at its extremity. This artery was secured. Both boys are still living.

Hemorrhage from an artery has been divided into primary and secondary; the former when it occurs within thirty hours after the receiving of the wound, or rather when reaction of the system has taken place, which is usually within eight hours; secondary, when it takes place after this period, but no definite time can be specified. It has been ascertained, from a record of several cases, that the thirteenth day is the critical one;

but I have known it occur in the arteries of the leg on the twenty-first day. When the smaller arteries are wounded, such as those in the palm of the hand or the sole of the foot, compression with lint or agaric, dry sponge, sponge tent, and a bandage, may be employed; but it is much safer to cut down and secure them with ligatures. Sponge tent consists of sponge dipped in melted wax, and forcibly pressed into the smallest possible size. The same kind of compression is applied to the intercostal arteries, and the extreme branches of the internal maxillary after the extraction of a tooth; to the internal pudic artery when wounded in lithotomy, but this vessel can be easily secured by an aneurism-needle; and to the temporal, which latter, however, is stemmed by cutting it across below the wounded point. When a vascular surface, as the mucous membrane of the nares, is bleeding, escharotics, styptics, and compression by dry lint are used. If the bleeding proceeds from the stomach, styptics are administered, and venesection to produce fainting, which greatly favours the natural process of arresting hemorrhage, and along with these cathartic enemata, low diet and rest are essential. If from the lungs, the same remedies, with narcotics and gentle laxatives. When from the corpus spongiosum or cavernosum penis, compression and bandage, or the actual cautery. The styptics in use are cold water, vinegar and cold water, solutions of the sulphates of zinc, alum, iron, or copper, of the nitrates of silver or copper, the mineral acids, diluted alcohol, alcohol and sulphuric acid combined. If the bleeding is from the gums, or antrum maxillare, or orbit, after a surgical operation, compression or the actual cautery is requisite. To arrest bleeding, the actual cautery should be moderately heated, only at a black heat, and the instrument ought to be held lightly to the bleeding part, and cautiously removed, to prevent the eschar made being pulled away.

Small veins, and sometimes the larger, are readily stemmed by compress and bandage, particularly if there is a firm resistance, as a bone. When a vein, such as the axillary, is wounded, an accident I have seen occur in the careless excision of axillary glands, a ligature must be thrown round it, below and above the wounded point. The same

must be the practice when the external jugular vein is accidentally wounded in the operation of securing the subclavian artery.

When the venous trunk of a limb, as the axillary or femoral, is divided across, mortification is liable to supervene, and when this termination appears, the sooner amputation is had recourse to, the safer for the patient.

Transfusion.—When a person loses such a quantity of blood as nearly to exhaust life, we have recourse to transfusion, which consists in injecting a little of the blood of a vigorous into the venous system of the dying man. One of the veins at the bend of the arm of the patient is opened, as in phlebotomy, into which is inserted a common injecting pipe of the dissecting room. A vein of the arm of the healthy individual is next opened, and the blood collected in the cup of the transfusing apparatus; then the surgeon, after ejecting one or two syringefuls, to exclude any air, injects a drachm or two into the pipe in the arm of the patient. The blood thus propelled into the exhausted circulating system, re-excites the heart, and puts the springs of life into action. It is only necessary to inject a few drops of blood to stimulate the heart, and probably the saline solution, which was so extensively and beneficially used in cholera, is preferable to human blood. It is much more manageable, and by keeping the arm of the dying patient under warm water during the process, the admission of atmospheric air is with more certainty prevented, since a few bubbles prove fatal.

CHAPTER III.

DISEASES OF THE BONES.

The bones are subject to the same diseases with the soft parts of the body, the phenomena merely differing in consequence of the hardness of their structure; thus they are attacked with inflammation, which ends in adhesion, suppuration, abscess, ulceration, mortification, and carcinoma.

Ostitis.—This inflammation is termed ostitis, and is characterized by the same symptoms and appearances as described under inflammation, the pain being more or less severe, according to the compactness of the bone, which, in consequence of its unyielding nature, prevents the expansion of the nerves and blood-vessels; the redness, tumefaction, and increased heat being more or less developed, according to the exposed nature of the bone. The same mode of treatment is also to be followed, with this difference, that as the bones are deeply seated, counter-irritants are more necessary. Adhesion is exemplified in incised wounds of the cranium, and in simple fractures.

Periostitis.—When the periosteum is the seat, the inflammation is named periostitis, and the same symptoms are present as in ostitis, but they are ushered in more quickly, especially if it cover a bone near the skin, as the tibia. The integuments in such a case are early involved, and are either red or pale with

some œdema. Unless actively treated by incisions down to the bone, the periosteum is separated from it, and suppurates or sloughs, ultimately inducing necrosis of the bone. Rest in the horizontal position, with the limb raised and diligently fomented, together with open bowels and moderate diet, are necessary auxiliaries. Resolution of periostitis is generally followed by thickening of the membrane, which must be discussed by counter-irritants, otherwise necrosis will still supervene. The mildest and best is tincture of iodine. When a deeply-seated bone has its periosteum inflamed, the only distinction between ostitis and periostitis is the greater tumefaction of the latter. The treatment is the same ; a number of leeches are to be applied to the integuments in the vicinity, followed by fomentations, with rest, low diet,' and open bowels. Blisters with the nitrate of silver, and eschars with the potassa, are indispensable. When the periosteum is affected with chronic inflammation, it either secretes coagulable lymph, forming a node, or this combined with ossific deposit, termed exostosis, of which there is the same variety as in the tumours of the soft tissues of the body.

Abscess.—The soft spongy bones of the carpus and tarsus, the epiphyses of the long ones, and the vertebræ when inflamed, form abscesses, because their blood-vessels have sufficient latitude to form suppurative papillæ. These are treated in the same way as an abscess in the soft parts; the red oxide of mercury finely levigated is often necessary to be applied once a week or so. When a long cylindrical bone, as the tibia, is the seat of abscess, as depicted in Plate VIII., fig. 4; if the preceding treatment fail, the base of the abscess should be excised by saws and trephines. Abscesses in the bones sometimes accompany necrosis.

Caries.—These bones, upon the same principle, when inflamed become carious, or, in other words, the abscess bursts, or the suppurative papillæ are exposed, and the bone is found ulcerated, for caries (from κειρω) is ulceration of the bones, and, consequently, is subject to the same variety as ulcers of the soft parts; and caries not unfrequently follows ulceration of

the contiguous soft parts. When caries attacks one of the carpal bones, a deposition of callus is occasionally generated, which forms a barrier to the progress of the disease; at one time a carious bone becomes soft and diseased throughout, having a fleshy or fatty appearance; at another, it becomes dry and friable, crumbling down under the probe; in some instances a separation takes place between the carious and healthy portions, the former being thrown off like a slough. Caries generally attacks the surface of a bone, and extends deeper and deeper, but it may begin in the centre; when the bones of the carpus, tarsus, or vertebræ are attacked, it very frequently spreads from one to another; the cartilaginous surfaces of these bones resist longer than the osseous shells. When this disease attacks the sternum, or any other superficially seated bone, the malady is more easily cured than when a deep-seated one, such as the acetabulum of the os innominatum. Caries attacks the young constitution much oftener than the adult, and spreads with greater rapidity, but heals more quickly; it occurs chiefly in the scrofulous and syphilitic. From the preceding statements, caries may be divided into as many species or varieties as ulcers; therefore there are, the simple, the inflamed, the indolent, the phagedenic, the gangrenous, the scrofulous, the syphilitic, and the scorbutic caries; on this account, the carious ulcer, described by authors, evidently involves two or three species of caries or carious ulceration. Some authors make other divisions, but they are also objectionable.

Simple caries is seen in caries of the sternum, the end of a bone protruding after amputation, and in compound fracture when the bone is freely exposed. In these there is little difference from what occurs in the simple ulcer of the soft parts, and none in the treatment. The carious portion must be freely exposed, and the integuments and all sinuses of the bone freely laid open, there being no less but more necessity for bringing it into view than even the ulceration of the soft parts.

The irritable or inflamed caries presents the same granulations and discharge as the inflamed ulcer does; it is this species which tinges the silver probe yellow or black, and when it attacks one of the bones of the carpus, or tarsus, it spreads and

involves so many, that not unfrequently amputation of the hand or foot is necessary. The antiphlogistic treatment requires to be vigorous in such cases, and all abscesses or sinuses must be freely laid open. If the caries become phagedenic, that portion must be removed with the trephine or knife, or destroyed by the red oxide of mercury; and if these fail, amputation ought to be performed. But if the caries assume a simple or healthy aspect, it is to be treated accordingly; or if it become indolent, to be stimulated with solutions of the nitrate of silver, or sulphate of copper, or the red oxide of mercury. Moxas, or potass eschars, in the neighbourhood of caries, are powerful auxiliaries; thus, when the astragalus, tibia, and fibula have been carious, moxas round the ankle-joint have cured them. The phagedenic caries is best exemplified in severe cases of Noli me tangere; the fungous caries, in caries of the sternum, where the granulations are sometimes very large and flabby. The scrofulous caries, or caries occurring in the scrofulous constitution, affects either the vertebræ or the joints; and when the former are the seat of this disease, either distortion with or without paralysis of the lower extremities, or lumbar abscess, is the result. From the great weight which the spinal column has to support, and the delicate spongy nature of its structure, it is very readily distorted, even from continued awkwardness of attitude, in the young and feeble. Whenever the muscles on one side of the spine gain the least ascendency over their antagonists, they instantly lay the foundation for distortion, and in many cases, sooner or later, caries is the consequence. If early attended to, the common steel stays should be worn when the patient is erect, but the greater portion of the twenty-four hours should be passed in the recumbent or horizontal position. Open air, sea-bathing, flesh-brush, attention to the diet and bowels, are powerful auxiliaries. If the affection has been neglected, repeated cupping, and moxas, or potass eschars, should be applied in succession from the occiput to the coccyx, together with the means just mentioned. The patient should remain in bed on a firm hair mattress, until all pain have been subdued, and even all tendency to a relapse have disappeared. In severe spinal affections, the spinal marrow is found quite

disorganised, there is complete mollescence, with more or less purulent matter exteriorly.

Necrosis.—When the long cylindrical bones are seized with inflammation, their vessels, having no latitude to expand and form ulcerative papillæ, become gangrenous, so that the bones are deprived of vitality, and either exfoliate or undergo necrosis. Exfoliation or necrosis seems to take place according to the exposure or non-exposure of the bones; thus the bones of the cranium exfoliate, while the os femoris becomes necrosed; the tibia, however, either exfoliates or necroses. If the tibia is inflamed, and an abscess occurs superficially to it, the bone generally exfoliates; the inflammation being too violent for necrosis, according to the interpretation of the term by surgical writers, who consider it the death of the old bone, with the formation of a new one exterior to it, whereas, etymologically, it means merely the destruction of the old bone, being derived from νεκρω. In such a case, the abscess is to be freely opened, and the condition of the bone examined; and if it appear divested of vitality, either the red oxide of mercury, finely levigated, or the nitrate of silver, must be applied to accelerate the exfoliation of the sequestrum, or it is to be removed by cutting instruments. See Plate VIII., figs. 8. and 11. The tibia is sometimes deprived of vitality in extensive ulcers of the leg, in consequence of the periosteum being removed by the ulcerative absorption; in which case granulations are occasionally formed beneath the outer layer of bone, which thus becomes a sequestrum, so that both caries and necrosis exist at the same time. Caries and necrosis also sometimes exist together in ulceration of the spongy bones, especially the os calcis, from chilblains. This is exceedingly common in children, and is slow in its progress. There is considerable tumefaction of the heel, with chronic phlegmonous inflammation, and a deep sinus leading into the centre of the os calcis, which is felt rough when the probe is inserted. See Plate VIII., fig. 5. The treatment is to subdue inflammation, next to enlarge extensively the wound, and to scoop out with a director the carious and necrosed portions. The trephine, however small, which is often used in this case, is liable to

injure the cartilaginous shell of the os calcis, induce more inflammation, which will extend to the astragalus and other bones, and demand amputation. The actual cautery, also often employed, produces more caries, so also does the potass. The red oxide of mercury is the only safe escharotic. When the cranial bones are exfoliating, they are to be sprinkled with the red oxide of mercury, and gently shaken from time to time, and not rudely removed. They often undergo this process in middle life, from chronic abscesses in the scalp, caused by slight blows, and even cold; and when the disease begins, it too often invades more than one of the cranial bones, until it proves fatal, of which I have now seen a few instances. One of these patients had every cranial bone, as it were, trephined, and closely resembled the case detailed by Mr Stewart in the Edinburgh Medico-Chirurgical Transactions. My patient ascribed his to cold, never had syphilis, and he had taken no mercury. The representation in Plate VIII., fig. 7., was taken from a subject in the dissecting room. Alteratives, as the sarsaparilla and nitric acid, should be prescribed. In rambling boys, particularly of the scrofulous diathesis, this affection of the cranial bones is often met with.

Portions of the cranial bones die, apparently from too great a deposition of phosphate of lime obliterating their blood-vessels; the dead part becomes an extraneous object, excites irritation, and causes a separation between it and the living portion. When the piece exfoliated is small, it is regenerated by the vessels of the pericranium, dura mater, and diploe; but when very large, it is never regenerated.

When the shaft of one of the long bones dies, a separation takes place between it and the epiphyses; the periosteum inflames, with thickening and an accumulation of blood-vessels; and if the inflammation be moderate, these vessels, together with those of the epiphyses, begin to secrete callus, in order to replace the decayed part; and after the secretion of the new bone has extended from the one epiphysis to the other, the periosteum loses its injected appearance, returns to its natural colour, and nearly to its natural density. In other instances, as already mentioned, the disease begins in the periosteum, which inflames, and separates from the bone,

which then dies. This is the more common modus operandi. The new shell now separates from the old bone, and the latter either slowly separates into sequestra, which are evolved, or are confined, and produce caries of the epiphyses, profuse suppuration, with hectic symptoms, requiring amputation. During this process, the limb is inflamed and swollen, with diffused pain along the bone; abscesses next form, with ulcerous openings, which become fistulous, discharging purulent matter; these apertures in the bone, see Plate VIII., figs. 1. and 2., are named cloacæ. In the beginning, there is inflammatory fever, which changes to hectic as the discharge and irritation increase, and these occasionally alternate throughout the progress of the affection. A profusion of callus is at first poured into this new shell, rendering it solid for a time, but afterwards the absorbents make it nearly as hollow as the original. The new bone is at first merely a reddish fluid, next gelatinous, then cartilaginous substance, fourthly ossific, or the phosphate of lime is deposited. In many cases, instead of the whole, there is only a part of the periosteum which inflames, and causes a partial separation of the bone, to be thrown off in thin scales.

Necrosis occurs chiefly in early life, except when the inferior maxillary bone is affected, which is generally after thirty years of age: it attacks the tibia, os femoris, clavicle, os brachii, fibula, radius, and ulna; and there is a case detailed by M'Donald, wherein nearly all the bones of the body were involved.

As long as the fever is inflammatory, and the limb acutely inflamed, the treatment should be antiphlogistic, with fomentations and poultices, unless it has begun in the periosteum, then incisions should be employed, as recommended in periostitis; and when these conditions have been subdued, if no fistulous ulcers have formed, counter-irritants should be repeatedly applied; but if there are ulcerous or fistulous openings, simple dressings; the constitutional remedies being mild nutritious diet, exposure to the open air, and sea-bathing, if practicable. The dead bone ought to be examined from time to time, and whenever the director or probe can be passed on each side of it, or it can be felt loose, it should be extracted. If it has begun to force its way outwards, it should be removed;

whenever the health begins to sink, the bone must be abstracted, otherwise amputation will be the only alternative, which otherwise need not be resorted to, until hectic fever threaten to destroy the life of the patient. The mode of extracting the dead bone will be readily understood by examining the two drawings in Plate VIII., figs. 1. and 2. Two or more of the fistulous apertures, *a*, *a*, *a*, are to be connected by an incision with either a sharp-pointed or probe-pointed bistoury, and the new bony shell brought into view. The old bone is then to be attempted to be withdrawn at the largest cloaca *a*, fig. 1., but if this should be too small, the cutting pliers, fig. 8. of Plate VIII. must be employed to enlarge it, which incision should extend in the line of the bone. Even now the old bone may be so wedged and connected with the epiphyses, as to defy extraction, until it be broken in pieces with the cutting pliers. Some hemorrhage always accompanies, which is to be stemmed by stuffing the new shell with long stripes of lint, the number of which ought to be noted. During the cure, the patient must be guarded against using the limb before the bone have become properly consolidated, as it is very liable to be fractured. Various absurd remedies are recommended for this disease, as madder, assafœtida, hemlock. Its causes are very obscure; the exanthematous fevers, syphilis, mercury, scrofula, and scurvy, also cold and blows, are considered predisposing; but inflammation is the proximate cause in early life, and obliteration of the blood-vessels in advanced age.

Exostosis.—If we are permitted to continue the analogy with which we set out, between the bones and the soft parts, they should be subject to the same varieties of tumours; of the truth of which I have not the least doubt, particularly when affected symptomatically. At present, they are confined to Exostosis, from ἐξ and ὀστεον, which is divided into various species by different authors, as true, false, periosteal, medullary, cartilaginous, and fungous exostoses, and they sometimes acquire considerable magnitude. Exostosis chiefly attacks the dense bones, which are thinly covered, such as those of the cranium, inferior maxilla, sternum, clavicle, ulna, and tibia,

although any bone may be affected. The periosteal exostosis is simply a diseased thickening of the periosteum, forming a tumour chiefly attacking the bones of the cranium and tibia, and occurring generally in the syphilitic constitution; but if not attended to, it commonly involves the bone. Sir A. Cooper considers this affection an osseous deposition between the bone and the periosteum, which adheres firmly to both. In its early stage, it may be removed by the application of the moxa or potass, nitrate of silver or iodine, and the internal administration of sarsaparilla and nitric acid. Medullary exostosis is when the medulla is primarily affected, and the cancellated structure secondarily; this may be treated in the same manner, but generally requires the knife. The cartilaginous exostosis is when cartilage forms the nidus for ossific deposition, which sometimes grows to an enormous size, and frequently attacks the inferior maxillary bone, requiring the removal of more or less of the sound bone on each side. It also takes place on the sternum and ribs, from whence it may be removed. The fungous exostosis is still softer, containing spiculæ of bone, and being of a malignant nature, it acquires occasionally a prodigious magnitude. This is evidently the cellular or laminated osteo-sarcoma of some authors, or osteo-sarcosis, or osteo-malakia, or spina ventosa. It attacks the diploe of the cranial bones, the inferior maxillary bone, and the long cylindrical bones. This exostosis can be only cured by the knife, or amputation. Besides these, there is the exostosis eburnea of some authors, a small hard tumour generally situated on the os frontis, the exostosis petrosa, and the stalactitical exostosis. Hydatids are occasionally found in exostosis. From the magnitude which some of these species of exostosis acquire, they impede the functions of the contiguous soft organs; thus when situated in the antrum, the eye; in the cranium, the brain; on the cervical vertebræ, the spinal cord, and in some cases the subclavian artery; on the inferior maxillary bone, the pharynx and larynx; and on the os pubis, the urethra. Various ridiculous remedies have been recommended for these tumours, and different instruments invented; for example, Jeffray's flexible saw, Machell's chain saw, Graefe's orbicular saw, and Thal's rotation saw.

Mollities ossium, named also malacosteon, is that disease wherein the bones become so soft that they may be twisted or bent in any direction, and being deprived of their earthy property, as if they had been macerated in diluted muriatic acid, their animal constituent only remains. When analysed, the quantity of phosphate of lime amounts only to about an eighth. This disease occurs generally about the middle period of life, and more frequently in women than in men. It is preceded by fever and acute pains in the bones, and the urine contains a quantity of phosphate of lime; it is of long duration, Madame Supiot having lived five years. Its treatment is by attention to the early febrile affection, and afterwards to diet and regimen, exposure in the horizontal attitude to the open air, cold bathing, flesh-brush, and steel stays.

Rachitis, or rickets, which depends also on a deficiency of the earthy property of bones, is closely allied to mollities ossium, but generally attacks the child, even the fœtus in utero. In rickets, the spine and ribs are commonly first affected, and afterwards the long cylindrical bones; the abdomen is tumefied in consequence of the liver, spleen, and mesenteric glands being enlarged; the intestines are filled with flatus, the digestion impaired, the breath fetid and sour, and the stools fetid, acid, and liquid. The respiration is also more or less affected, with a precocity of intelligence, and the head peculiarly large. A singular peculiarity in this disease is, that those children who recover from it in early life, and continue strong until adult age, become again affected with it. The bones, after death, are found lighter, flatter, of a red or brown colour, porous, spongy, soft, compressible, vascular; the cranial and the long bones are thinner, and the medulla is like reddish serum. The treatment consists in diet, regimen, exposure to the open air, cold bathing, flesh-brush, and steel stays, with props for the legs, and even for the head.

Fragilitas ossium may be considered the opposite of mollities, although, according to Boyer, the two diseases are combined. In this, there is a superabundance of the phosphate of lime in the bones, and hence it occurs in advanced life, and in either the syphilitic, scorbutic, arthritic, cancerous, scrofulous,

or rachitic, and therefore symptomatic of some other disease. It is only in the scorbutic and syphilitic that any hope of cure, always very doubtful, can be held out. Saviard details a very remarkable case of this disease, where all the bones, after death, crumbled under the fingers.

The last remaining disease of the bones will be described under affections of the joints, namely anchylosis, a result much to be desired on many occasions; but it has occurred without any marked increased action, as in the extraordinary case of Clark, detailed in the forty-first volume of the Phil. Trans., where all the bones, from the crown of the head to the sole of the foot, were completely soldered together; the skeleton was long preserved in the Museum of the College of Surgeons of Dublin.

FRACTURES.

Fracture, from *frango*, is applied to the bones, and is divided into simple, compound, oblique, transverse, longitudinal, comminuted, and complicated; simple, when the bone only is injured; compound, when the soft coverings are so injured that either one of the fractured ends protrudes through the skin, or the skin and muscles are so lacerated as to expose the bone; oblique, when the centre of the shaft of a long cylindrical bone is broken; and transverse, when this bone is fractured at its extremes or epiphyses; longitudinal fracture, occurs also to the long cylindrical bones; a comminuted fracture, is when a bone is broken in different places at once, and divided into several fragments or splinters; complicated, when accompanied with luxation, severe contusions, and wounded blood-vessels, also when occurring in the gouty, scorbutic, rachitic, and syphilitic constitution. Fragilitas ossium is likewise a complication. These diseases prevent the union of the bones, and also render them very easily broken. Pregnancy used to be considered a preventive to the union of fractures, but this has been found erroneous. Cold makes the bones more fragile; besides, they are more brittle in old age. The superficial are more exposed to be fractured than the deep-

seated; thus the clavicle is more so than the os innominatum. Others, from their functions, are more exposed, as for example the radius, from its affording support to the carpus. The long cylindrical bones of the limbs, are more frequently fractured than the round irregularly shaped; the bones of the cranium more than those of the face; and the former in various directions, occasionally stellated. The carpus, tarsus, and vertebræ, are commonly fractured transversely.

Fractures are caused by external violence, the action of the muscles, and disease.

When a fracture takes place, there is an effusion of blood from the vessels of the bone, periosteum, and contiguous parts; the muscles are generally violently excited; the periosteum and truncated ends of the bone inflame. The absorbents are excited to remove the effused or ecchymosed blood, and as the inflammation subsides, the vessels of the periosteum and ends of the bone seem to be formed to secrete callus, which is an effusion of gelatin; this is gradually converted into cartilage, and lastly into bone, by the secretion of phosphate of lime, precisely in the same manner as the formation and conversion of bone in the fœtus. During the inflammatory action no diseased secretion takes place; even the healthy ones are more or less suspended, and callus does not harden for many days; in the adult, it begins generally about the fifteenth day; Boyer, however, says, that it is not formed till between the twentieth and seventieth day.

The lacerated periosteum becomes much thickened, as in necrosis, to some extent in the neighbourhood of the fractured ends of the bone, and a crude broad ring of new bone surrounds and unites them, which, with that secreted by the ends of the bone, resembles the knot in the engraftment of young trees. In a few months this mass is greatly reduced by absorption, and, when bisected, is very dense ossific matter, seldom or ever cancellated. Fig. 7. of Plate IX., is a section of a united fracture of clavicle.

The symptoms of fracture are said to be, inability to move the limb, crepitus, tumefaction, and pain; but these are not always present, and are sometimes in luxation; thus

some have been able to walk with a fracture of the tibia, and have broken the fibula in the attempt; the tibia might have been only fissured at first. Crepitus is often found in dislocated joints, tumefaction in sprains, and pain is often absent from fracture.

The treatment of a simple fracture of the tibia, for example, is to lay the limb on Mr M'Intyre's or on Mr Liston's splint, Plate IX., fig. 1., well cushioned, and slightly bent; to apply a bandage from the toes upwards, and gently over the fracture, another from the top of the splint and thigh downwards to the fracture. Let the lower bandage be pinned immediately distad to the fracture, so that its upper portion may be unrolled, when required to examine the condition of the fracture. Let the foot of the splint be raised as high as agreeable to the patient, to favour the venous and lymphatic circulation, and to prevent inflammation. Let the region of the fracture be fomented if necessary; the patient be put on low diet, rest enjoined, and gentle laxatives administered, until every tendency to inflammation have subsided. Then generous diet should be allowed, and the limb bandaged firmer and firmer, but never examined at this stage of the cure, unless the bandages become slackened, or the fractured ends of the bone displaced. If no union have taken place, at the end of six weeks or two months, pasteboard splints cushioned with tow, ought to be applied on each side, very firmly bandaged, and the limb again laid on its iron splint, and retained for two or three months longer. If there be still no union by this time, viz. five months, it is to be feared that a false joint has formed. If the process of re-union has gone on mildly, the patient may be allowed to sit up with the splint at the end of six weeks, or with Dupuytren's splint, which is much the lighter. It closely resembles Desault's long splint for the thigh bone represented in Plate IX., fig. 5., being merely shorter, extending from the head of the fibula or tibia, to a little beyond the sole of the foot. But if there has been any inflammation, or the fracture been near the ankle-joint, upwards of eight weeks should be allowed to elapse before sitting up. The patient should walk on crutches with his foot suspended by a broad belt over his shoulders for the first month

or so; and not attempt to put it to the ground for four months from the reception of the injury, even in the most favourable case, because any weight pressing on the newly formed bone is liable to excite absorption, and thus reproduce the fracture. During the treatment, there is often considerable inflammatory action, which is not unfrequently caused by tight bandaging; hence for the first eight or ten days, the site of the fracture should be examined every second day, but the ends of the bone never disturbed. In many cases there are several small vesicles, arising from the tension of the skin, which disappear by fomentations and the elevation of the limb; but if not, the bandage over the distended part must be removed. If suppuration or gangrene threaten, incisions must be made. Leeches commonly producing erythema, ought to be avoided. When the fractured ends are apart on reception of the injury, they should be carefully put in apposition by gentle extension made at the ankle-joint, and kept in contact by bandage and compress of lint: inflammation is to be watched. It is the dread of this which has divided the Profession with regard to primary and secondary setting, for either of which cogent reasons may be adduced. Primary, I have already described, and when judiciously employed, prefer it in the majority of cases; but I have seen a simple fracture, nay even a fissure of the tibia, converted into a compound fracture, and an equally simple fracture of the fibula, into a compound luxation of the ankle-joint, both of which ended in amputation. Secondary setting consists in placing the limb in the position easiest for the patient, regardless of the fractured ends of the bone, and in fomenting, low diet, and rest, until all inflammation have been subdued; then extending the limb, and placing the fractured ends in apposition.

When there is a compound fracture of the tibia, which is mostly accompanied with a simple fracture at least of the fibula, and if the bone protrudes such a length that it cannot be with facility returned within the skin and muscles, it should be sawn off, for it would be too injurious to the soft parts to make an incision to replace the protruded portion; but in this and other thinly covered bones it may be warrant-

able to incise the integuments, to permit the reduction. After the bone has been replaced, the wound, if simple, may be approximated, but if contused, fomentations are requisite. No callus is secreted during suppuration; and as this wound will suppurate, the limb should be placed on Liston's fracture-splint, an ordinary or eighteen-tailed bandage applied to prevent the pus burrowing, and to keep on the dressings, which should be simple; and just as suppuration abates, callus is secreted. When suppuration is established, the diet should be nutritious. The pus often burrows towards the popliteal aspect of the limb, and requires a counter opening, which is done by inserting a probe, and cutting down upon it with the straight bistoury.

It not unfrequently happens, that the protruded bone has been so contused, that it undergoes exfoliation, in which case it must be sawn off, but never while there is any inflammation. This is one reason for the removal of a protruded bone in compound fracture; another is, that it allays irritability of the muscles, and prevents increased action. This practice is much to be commended.

If the fracture is comminuted, we either extract the loose fragments of bone, and treat it afterwards in the same way as has been described; or we take into consideration amputation, for comminuted fracture is generally compound. If the integuments are not wounded, and the fragments of the comminution large and not numerous, every exertion should be made to preserve the limb.

When a fracture of the tibia is complicated with a wound of the anterior or posterior tibial artery, or with compound luxation of ankle-joint, much must depend on the nature of the fracture, and much, therefore, left to the consideration of the surgeon, whether an attempt should be made to preserve the limb. In general we now endeavour to save what our predecessors amputated. This will be more fully treated of under Luxation.

Fracture of the tibia, into knee or ankle joint, is naturally much more serious than that between these: the same may be said with regard to the fibula.

Simple, or even compound fracture of the tibia, or tibia

and fibula, is often produced by very slight causes, such as merely a fall while walking. Many individuals first fracture the tibia in such an accident, and on trying to walk, next fracture the fibula.

Fracture of the tarsal bones now and then occurs, especially that of the os astragalus, and then is generally complicated with luxation of ankle joint; of which hereafter. The os calcis is sometimes broken by a fall from a height, the heel sustaining the whole weight of the body; and when only in two or three pieces, or simply fissured, the case is difficult of detection; but when in fragments it is readily discovered. Let the foot be extended, to relax the tendo Achillis, and the os calcis grasped and moved from side to side, when there will be some degree of motion, and probably crepitus. The treatment consists in putting the pieces of bone as much as possible in situation, placing the limb in Liston's or M'Intyre's Splint, with the angle at the poples as acute as possible, to relax the gastrocnemius and soleus muscles, and with the foot well raised; or the limb may be simply laid on its fibular aspect resting on a pillow; the foot should be assiduously fomented. When the fracture is comminuted, inflammation and suppuration are liable to follow, ending in amputation. In some instances, when the injury is received, there are all the appearances of a sprain round the ankle joint, with globular swellings on each side, and hence the necessity of careful diagnosis. Comminution of os calcis requires immediate amputation.

When two or three of the tarsal bones are fractured from an injury, as a loaded waggon passing across the foot, there is extensive contusion and tumefaction, and often such lacerations of the soft parts as to demand amputation; but if not, the foot ought to be raised, and constantly fomented, to keep down inflammatory action, and prevent suppuration; for when the latter takes place, the articulations become involved, and require amputation of the foot. Whenever matter forms in such accidents, it must be freely evacuated. Here the antiphlogistic treatment must be rigidly pursued.

When the metatarsal bones are fractured, there are commonly two or more of them at a time, often with such firm

tumefaction as to prevent the detecting of the accident: in all instances, the foot is much shortened. The fractured ends should be reduced, the foot raised and fomented, and the antiphlogistic treatment adopted.

The phalanges of the toes are seldom fractured individually; this is easily detected, and requires ordinary treatment. When the fracture is compound, it is commonly accompanied with luxation, and destruction of the flexor tendons, and then demands amputation.

Fracture of Patella.—This bone is for the most part fractured transversely from the power of the muscles, while attempting to recover oneself making a false step. The nature of the accident is readily perceived by the gape between the portions of the bone, and the patient being unable to walk. There is generally considerable tumefaction of the knee joint from effusion of blood into its cavity, from the laceration of the synovial membrane. The limb should be extended, and the body raised as much as the patient can bear, to relax the quadriceps muscle; a bandage is then to be applied from the groin down to the upper fractured portion, while another is to be rolled from the toes upwards to the lower half, chiefly to give support to the venous and lymphatic circulation, and thus prevent swelling of the limb; M'Intyre or Liston's Splint, perfectly straight, is a good rest for this fracture. The union here is never ossific, but fibro-ligamentous or cartilaginous, which however, if short, is equally useful. Sometimes the effusion of blood into the knee joint is so great as to prevent the approximation of the fractured portions for some days, and to produce so much excitement that a number of leeches, and diligent fomentation, may be indispensable.

Longitudinal fracture of this bone is very rare. Compound fracture is naturally a very severe and serious injury, since the knee-joint is laid open, and requires the surgeon to consider amputation.

Fracture of os femoris.—The thigh-bone may be fractured at any part, but this happens most frequently in its centre, is oblique and splintery, with crepitus and shortening of the limb,

the distal or lower overlapping the upper or proximal portion. The accident is readily recognised, and to be treated by Desault's long splint, represented in Plate IX. fig. 5. Let the patient be laid on a firm hair mattress, with the limb extended, and cushioned on its outer aspect; then let the wooden splint be placed along the limb, that it may extend beyond the foot three or four inches, and approach near the axilla; next put a common silk handkerchief well padded round the perineum, with the ends through the apertures marked *a a* in the axillary end of the splint, and secured with the sailor's reef-knot; fourthly, fasten this end of the splint to his body with another handkerchief passed round both; lastly, extend the foot, and affix it with a bandage to the distal end of the splint, rolled round both, in the figure of 8, and upwards along the leg and thigh to the hip-joint. Some prefer a common sheet round the limb to the bandage. The extension may be very moderate the first fortnight, if there are much pain and inflammation; but generally these are overcome, if the fracture be neatly adjusted, and the pressure properly regulated.

Fracture of the distal third of the os femoris is generally severe, as there is comminution affecting the knee-joint; the fracture being transverse near the condyles, split longitudinally; a common condition here, but very difficult to ascertain. The inflammation and suppuration may suggest the expediency of immediate amputation. I have seen not a few sink in the suppurative stage, with or without amputation.

Compound fracture of the thigh-bone is to be treated as recommended for that of the tibia, but with Desault's splint.

The neck of this bone is often fractured after 50 years of age, even from a slight fall, this portion being enfeebled by interstitial absorption. The limb is shortened, toes everted, and nates flattened; but if neglected, the toes become ultimately inverted, from the power of the adductor, and relaxation of the extensor muscles. In some individuals the limb has been lengthened, probably in consequence of the fractured ends having been spicular and wedged into each other. Since numerous cases have now occurred, wherein ossific union has taken place within the synovial pouch, for this depends on the extent of periosteum

left connecting the fractured portions, we ought to apply the long splint, and retain it as long as the skin over the sacrum remains sound, and the health will bear. There is in my possession one preparation of ossific union, and I am confident I have succeeded in uniting the fracture in several patients. However strong and neat the junction that under the treatment upon this principle may be, still the limb is a little shorter from interstitial absorption, and the angle between the shaft and neck is changed from the obtuse to the right or even acute. The skin over the sacrum, trochanter major, outer ankle, and heel, must be carefully watched. Hence Sir A. Cooper's division of this fracture into three varieties, becomes unnecessary; viz. 1*st*, that in which the fracture happens through the neck of the bone entirely within the capsular ligament; 2*dly*, fracture through the neck of the bone at its junction with the trochanter major, external to the capsular ligament; 3*dly*, when the bone is fractured through the trochanter major beyond its junction with the cervix of the bone.

Fracture of os brachii.—The bone of the arm is often fractured, but oftenest in its middle; this is easily distinguished. It is to be reduced, and the ends kept in contact with a pasteboard splint, extending from the top of the shoulder to the wrist, with the fore-arm bent across the chest, and the hand between pronation and supination. This splint is to be notched on each side at the elbow-joint, to conform to the bent position, and nearly surround the arm and fore-arm; at the shoulder it is to be cut on the inner side, so as to pass round the arm at the axilla. It should be damped and well cushioned with tow, and kept on with a bandage, and the arm supported by a handkerchief or sling over the shoulders. Fracture of the neck of this bone is frequent in advanced life, and requires careful examination, as it is liable to be mistaken for luxation of its head into the axilla. In the fracture, the rotundity of the joint is preserved. It should be treated as the preceding, with the addition of a pad in the axilla. Fracture near the elbow-joint at the epiphysis is frequent in rambling boys; this requires to be carefully distinguished, being very liable to be mistaken for luxation of radius and

ulna backwards behind this bone, but gentle extension of the fore-arm removes the disfiguration from the fracture. Treatment the same as the preceding. When the internal condyle is fractured, the olecranon ulnæ projects backwards, and as we extend the fore-arm there is marked pronation of the hand, which is removed on flexion. The treatment is the same as that for fracture of the humerus. When the outer condyle is fractured, there is a projection behind this end of the humerus, simulating luxation of head of radius. This is ascertained by being able, by gentle extension, in removing the deformity; and when the fore-arm is extended, by flexion being performed, as well as extension, though with some uneasiness. While the fore-arm is extended, if we rotate the hand, crepitus is sometimes heard. Treatment same as preceding.

Compound fracture of the humerus is rare, but when it does occur, it is to be treated like that of the tibia.

Fracture of ulna and radius.—The ulna and radius are often fractured conjointly in the middle, which accident is readily perceived. The fractured ends are to be replaced, and retained *in situ* by the same means as recommended for that of the humerus, only the splint should extend to the tips of the fingers, in order to give support to the hand. Great care must be bestowed in keeping the hand intermediate between pronation and supination, in all these fractures of the bones of the arm, otherwise, after union has been effected, there will be either inversion or eversion of the hand, rendering it totally useless.

Fracture of the distal end of the radius is very common, and must be carefully ascertained, as it is liable to be confounded with luxation of the wrist-joint. Moderate extension enables us to remove the deformity. To be treated as the preceding.

The ulna is fractured separately, at its olecranon process, its coronoid process, its middle, and its distal extremity. When the olecranon, the patient hangs the arm loosely by his side, and there is along with tumefaction the hard process separated from the shaft of the bone an inch or so. The surgeon can insert his finger in the gap, and imagine it is in the elbow-joint.

The treatment differs essentially from all the other injuries of the bones of the arm, the extremity being kept extended with a splint on its anterior or palmar aspect. A bandage must be applied from the shoulder to the elbow-joint, to keep the olecranon in contact with the ulna, and another from the fingers upwards, to prevent œdematous swelling. Here there is only fibro-ligamentous or cartilaginous junction, like that of the patella.

When the coronoid process is fractured, it is of difficult detection, the accident simulating luxation, for both bones, to a certain extent, fall behind the articular surface of the humerus. We can bend the fore-arm with ease, and if there be not much tumefaction, feel the isolated portion of the bone. The fore-arm is to be kept bent with the splint for fracture of os brachii, and a bandage rolled from shoulder to coronoid process, with a compress over it, and another bandage from fingers to elbow-joint. When this bone is broken near the wrist, the hand falls to the ulnar side, and from the contraction of the pronator quadratus muscle, there is a marked depression in the region of the fracture. It is to be treated with the splint recommended for both bones.

Fracture of bones of hand.—When the carpal bones are fractured, the injury is generally so extensive and severe, that it may require amputation. This operation, in many instances, may be only partial. If an attempt be made to preserve the hand, let the loose fragments be removed, the hand much raised, and active antiphlogistic treatment pursued. In a person, whose hands were severely injured by the blasting of rocks, I preserved the thumb and fore-finger of his right hand, and the two proximal phalanges of the fore-finger and the first of the middle and little fingers of his left hand, and thus he is enabled to earn his livelihood.

In fractures of the upper extremity, we are justified in attempting to save what we would not in the lower, because the arm has no weight to support, is nearer the source of the circulation, its arteries inosculate more freely, and its venous and lymphatic circulation more easily proceed.

The metacarpal bones may be fractured at their heads,

the head of the bone sinking into the palm of the hand, and so resembling dislocation. A large ball is to be gently grasped with the hand, extension made, and when the fracture has been reduced, a bandage applied. These bones of the thumb and little finger are most frequently broken. The phalanges, unless in early life, are very seldom fractured.

Fracture of the Clavicle is of almost daliy occurrence, because of its exposed situation, and its forming the fulcrum for the motions of the upper extremity. It happens chiefly in the centre of the bone, between the attachments of the strong antagonizing muscles, which separate the ends, and hence make it easily distinguished. The treatment consists in reducing the fractured ends, bending the elbow-joint, with the hand across the chest, as in fracture of the humerus, represented in Plate IX. fig. 4.; then putting a pad in the axilla, with a handkerchief over it, to be tied across the opposite shoulder, and the arm slung with another handkerchief in the usual manner. The patient is to be confined to bed on his back for the first three weeks, and then he may get up and walk about with the handkerchiefs and pad. Mr James Fortune has invented an ingenious sling and pads, especially one for the sound shoulder, which has to support the weight of the injured arm, and hence is easily galled or fretted. Compound fracture of this bone is very rare, but its spiculæ may injure the important vessels in its vicinity. Sometimes callus is secreted so profusely, as by pressing on the brachial plexus, to render the arm paralytic. I have seen it remain so three months.

Fracture of Scapula.—The scapula is but seldom broken, and when so, it is mostly its acromial process; the surgeon is then liable to mistake it for luxation of the head of the os brachii into the axilla. There is drooping of the arm, inability to raise it, and a marked depression at the tip of the shoulder; but the depression is within the attachment of the clavicle. On tracing the spine of the scapula, its acromion is at once perceived to be detached; and on raising the arm to a horizontal line, the deformity is removed, and the motions of the joint can be performed. To be treated like fracture of the clavicle, except

that there must be no pad in the axilla, but a large compress between the arm and the side near the elbow-joint. In some individuals, the acromial process continues an epiphysis throughout life.

The coracoid process is said to be broken off, but this I question very much; it must be along with the glenoid cavity, or there must be fracture of the neck of the scapula; an accident also, in my opinion, very rare, for I am persuaded that unreduced luxation of shoulder-joint has been mistaken for this, by good surgeons. In fracture of the neck of this bone, there is marked depression under the acromion, inability to raise the arm, and pain from the attempt. The surgeon, however, when the accident has been recent, can raise the arm, and remove all deformity. When he puts his left hand on the shoulder, with the thumb on the coracoid process, and rotates the arm with his right, he can also hear crepitus. To be treated like fracture of the clavicle, but two or three months in bed.

The inferior angle of the scapula is sometimes fractured, and this is easily discovered, but, from the antagonist muscles attached, it is with difficulty retained *in situ*. A broad flannel bandage, or riding belt, should be put round the body, and the arm bound to the side.

Fracture of bones of Face.—Some of the bones of the face are very much exposed to injury, as the nasal and inferior maxillary; injuries of the cranium will be treated of under those of the brain.

The Nasal Bones are frequently fractured, in more than one piece, by trifling falls and blows. The nature of the accident, from the disfiguration of the countenance, is readily seen. A pair of dressing forceps, or any round instrument covered with lint, is inserted into the one nostril, and the fragment on this side raised, while the fingers of the other hand are on the dorsum of the nose, to adjust it; then the instrument is to be put into the other nostril, and the broken portions raised in the same manner. Soft plugs of lint are to be kept in the nares for support. In some cases, there is severe headache, and in some meningitis or phrenitis has super-

vened. The patient, therefore, should be dieted and watched. Abscess of the mucous membrane, and destruction of the cartilages and bones, have followed. Compound fracture is perhaps the most frequent of all.

The inferior maxillary bone is not seldom broken, and mostly at its side, the injury extending, in an oblique direction, from the teeth backwards and downwards to the base; sometimes both sides are fractured, detaching the body from the rami. The accident is easily recognized, and is to be treated by tying the contiguous teeth together with strong silk, or silver wire, by applying a piece of moistened pasteboard, cushioned with tow, along the base, and a double or four-headed roller round the chin and head, somewhat similar to that represented in Plate II., fig. 3. The patient must live on slops four or six weeks. This bone may be fractured at its angle or its neck; and when the latter, a compress is to be put behind the angle. Compound fracture into the mouth is to be expected in all of these.

Fractures of Vertebræ.—The vertebræ are commonly fractured by falls from a great height, and most frequently across their bodies, and then there is more or less paralysis. When it occurs above the third cervical, there is paralysis of the diaphragm, and soon a fatal termination; when below or sacrad, there is palsy of the upper and lower extremities, of the bladder of urine, and of the rectum, with priapism; these symptoms continue for some weeks, and end mortally. When the fracture is sacrad to the second dorsal vertebra, the paralysis does not affect the upper extremities. The lower extremities are paralysed in all fractures below the dorsal, even when the sacrum alone is injured. Although the preceding symptoms are generally attendant on these accidents, they are far from being regular; cases have occurred wherein the second, third, and fourth cervical vertebræ were fractured, and yet respiration continued unimpaired, seemingly through the medium of the great sympathetic nerves. The atlas has been fractured, and the patient has lived twelve months; the sacrum has been fractured, and no paralysis. In all of these

instances the spinal cord and its membranes are more or less concussed, and in concussion alone of the spinal cord the same symptoms are evinced. In some the spinous processes are broken, in others the articular, in some the transverse, in others, the bodies of the vertebræ.

In all cases of fracture of the vertebræ, the diagnosis demands the utmost skill. The treatment is to lay the patient on his back, on a firm hair mattress, to apply leeches or cupping, to attend to the diet, the bowels, and the urinary bladder. In some it is necessary to keep a catheter in the urethra. In the greater number, inflammation of the mucous coat of the bladder supervenes. It has been proposed to incise the soft parts, and remove the fragments of broken vertebræ; and this was done a few years ago, as detailed in the Lancet, No. 182, but the patient died. The analogy between trephining the cranium, and the vertebræ, is fallacious. When we trephine the cranium, we do not expose any great extent of the dura mater; but when we remove a portion of a vertebra, we expose a great extent of the theca vertebralis. Besides, when the dura mater is incised, the arachnoid and pia mater fill up the wound, from the pressure made by the circulation of the vessels of the brain; but if a wound be made in the theca vertebralis, a great extent of the arachnoid membrane is exposed, and, if this last be wounded, the pia mater still more extensively.

Fracture of bones of Pelvis.—Fracture of the bones of the pelvis may happen. That of the sacrum has been just described. If the patient survive, a T bandage should be applied, which consists of a belt round the loins, with a bandage from behind forwards, passing along the sacrum, coccyx, and perineum. The coccyx is seldom fractured: this is distinguished by inserting the fore-finger of the left hand in the anus, while the fingers of the right are on the bone. It is easily reduced, and to be treated by the application of leeches and fomentations, to subdue the pain, which is very acute, and afterwards by wearing a T bandage.

The ossa innominata may be broken, and the violence which produces the fracture, causes extensive extravasation of blood, paralysis of urinary bladder and rectum, and, if the

patient survive long enough, abscesses and sloughing follow. In some, the urinary bladder is wounded, indicated by the patient voiding bloody urine. We detect such an injury by grasping with the one hand the os ilium of the one side, and moving the opposite os ilium with the other. Fracture through the acetabulum so raises the head of the thigh-bone, as to resemble luxation of this bone on the dorsum of the ilium. The least extension lengthens the limb, and produces crepitus. To be treated with the long splint of Desault, and a broad belt round the pelvis; but, if there is much inflammation, by leeches and fomentations until this be subdued. In some rare instances, the os pubis and ischium have been fractured, together with a separation of the os innominatum from the sacrum, shown by slight shortening of the limb, but no change of the foot to either side. To be treated on the antiphlogistic plan, and afterwards a broad roller round the pelvis: the patient to walk long with crutches.

Fracture of the Ribs.—The ribs are very liable to fracture from situation; and from the lungs being almost in contact with them, the injury is dangerous, especially when the fracture is spicular. They are generally fractured in the middle, and more than one at a time, and those in the centre of the thorax oftener than those at the extreme. The patient has acute pain in breathing, is unable to take a deep inspiration; and on examination there is some irregularity in their course, with a slight overlapping, and crepitation. The treatment consists in applying a broad flannel roller round the chest, confining the patient to bed, with the head and shoulders raised; let him be put on low diet, attend to his bowels, and watch inflammation of the pleura.

A fractured rib may wound the pleura costalis, producing pleuritis and empyema; may wound an intercostal artery, with fatal hemorrhage, or induce inflammation and empyema; wound the lungs, and cause hemoptysis, or effusion of blood, or pneumo-thorax, or emphysema.

Acute empyema, or a collection of pus in the bag of the pleura, should never be treated by operation, which always aggravates the disease. It is only when pus supervenes to

chronic inflammation, that there is the least chance of recovery, which is ever very precarious and uncertain. If the surgeon has attended the patient from the beginning, the diagnosis is not difficult; but if called in, when the secretion might warrant operation, he ought to examine very carefully. Let him place the patient in the sitting position, with his back towards him, and measure both sides of the thorax, then the affected should be wider than the sound side, the ribs more apart from each other, and remain nearly stationary during respiration; and on applying his ear, and shaking the patient, he ought to be sensible of distinct undulation. He may then perform paracentesis thoracis, which is done with a bistoury, and an elastic gum tube or catheter. The part to be selected is the centre of the affected side between the sixth and seventh ribs. The skin over the intercostal space is to be pulled upwards, that it may act afterwards as a valve, and the bistoury plunged almost perpendicularly, close to the upper margin of the lower of the two ribs, through the integuments, intercostal muscles, and pleura, into the cavity of matter; the bistoury is next withdrawn and the tube inserted, when the pus flows. During its flow, the patient occasionally faints, and then it must be stopt for a few minutes. After the evacuation of the fluid, the tube is to be removed, and the skin allowed to glide over the wound, a piece of lint applied, and a flannel roller round the chest. The patient should then be nourished and have tonics, with the intention of arresting the secretion; this, however, always returns after the first operation, and now the surgeon must watch carefully where the purulent fluid accumulates, for there he is to puncture the second time. The œgophany, and the gradual disappearance of all respiratory murmur, must be his guide. He cannot expect pectoriloquy. The pleura pulmonalis and costalis have in some degree united, and in this manner is the secretion checked. The operation may be repeated several times, but with less hope of success.

When emphysema follows the fracture of a rib, there is great difficulty of breathing, inability to lie in bed, suffocation, purple countenance, and small quick pulse. On examining the integuments in the site of the fracture, there is puffiness and crepitation, or the skin crackles when pressed

upon; but in some cases the skin is natural, which is the more dangerous. In the former, the spiculæ of the rib have wounded the lungs and the pleura costalis, in the latter only the lungs. The air inspired escapes by the wound of the lungs into the cavity of the pleura, accumulates, presses on the lungs of the affected side, and gradually condenses them, so as to overwhelm their functions; the mediastinum is next pushed to the opposite side, so as to reduce the expanse of the uninjured lung; and the circulation of the blood being thus impeded, death is inevitable. When the pleura costalis is extensively wounded, the air escapes by its aperture, relieves the lungs, diffuses itself in the nearest cellular tissue of the integuments, ultimately over the whole body, which may re-act upon the lungs, and compressing them prove fatal. In this last case, whenever the integuments in the vicinity of the fracture are observed to be inflated, they should be freely punctured with the lancet or bistoury repeatedly, as long as the inflation continues. The wound in the lungs generally heals, so that if no air escape from the bag of the pleura, a cure is accomplished. Most frequently the pleura pulmonalis adheres to the costalis, and in this way favours recovery. If the symptoms of suffocation continue after the air in the cellular tissue has escaped, a short incision must be made over the fracture, and rarefied cupping-glasses applied; and if suffocation still threaten, the wound in the pleura costalis must be enlarged, being careful that it is smaller than the rima glottidis. General bloodletting is unnecessary, as the punctures bleed freely enough to prevent inflammation of the pleura.

Emphysema has been caused by bayonets, small swords, and other sharp-pointed instruments, by blows on the back of the neck, larynx, and trachea, by foreign bodies in these passages, by violent reduction of a dislocated shoulder-joint; it has also occurred in difficult parturition, in pneumonia, in phthisis pulmonalis, in typhus and other fevers, and lastly, from a suppurated lymphatic gland in the lower part of the neck. There is a remarkable spontaneous case of this disease related in the Edin. Med. Chir. Trans.

Fracture of the Sternum.—This bone is very seldom

broken, except from so severe an injury, that the lungs and even the heart are contused or lacerated, causing sudden death. Emphysema is an ordinary complication. The accident is readily recognized; there are great difficulty of breathing, inability to lie in bed, cough, and spitting of blood. A roller should be applied round the chest, and the treatment antiphlogistic. If he recover, an abscess generally forms in the anterior cavity of the mediastinum; this requires skilful diagnosis, as aneurism of the arch of the aorta might be mistaken for it. When satisfied it is an abscess, let it be treated as recommended.

False joint.—When a fractured bone is disturbed in its process of union by officiousness, or when there exists some idiosyncrasy, preventing the secretion of callus, the ends of the bone become clothed with a fibro-ligamentous or cartilaginous substance, while the contiguous cellular and muscular tissues are formed into a rude fibrous capsule, invested with a synovial membrane. In this manner is a false joint formed. The os brachii is said to be most subject to false articulation, and probably in consequence of the patient being allowed to walk too soon; but I have seen it as often in the os femoris, in the tibia, as also the clavicle. Did it depend on mobility, the clavicle should be the bone most frequently affected.

Whenever a recently fractured bone does not unite after the means recommended for that of the tibia in page 139. have been tried, we ought to suspect that a false joint has begun to be formed, and should insert a seton between the fractured extremities; the most efficacious, safe, and manageable treatment. The cord must remain for fifteen or twenty days, and when removed, the pasteboard splints are to be applied and very firmly bound together with any other splint, according to the bone affected. A seton is best inserted here, by passing a narrow bistoury between the fractured ends as far as possible to the opposite side, carefully guarding against blood-vessels; following this with a probe, threaded with a cord, which if possible is to be cut down upon, and brought across, leaving the cord between the fractured ends. The diet ought to be very nutritious. But when, for example, in fracture of the tibia,

the head of the probe would require to be cut down upon in the popliteal aspect, through the gastrocnemius and soleus muscles, we should run a risk of wounding the posterior tibial artery, the probe itself must be left between the fractured ends two or three weeks, and moved about every three or four days. The intention here is to convert it from a simple to a compound fracture, for whenever suppuration is thoroughly established, the probe or seton is to be withdrawn, and then callus is secreted. When the os femoris remains disunited after a fracture near the knee-joint, we neither can insert probe nor seton, lest we excite inflammation.

The other modes of treating this affection are, the application of escharotics, rubbing the ends of the bone on each other to inflame them and induce the secretion of callus, finally cutting down to them and rasping them, or sawing off the ends.

CHAPTER IV.

DISEASES OF THE JOINTS.

The joints are prone to acute and chronic inflammation, with their usual terminations, and also to a few peculiarities depending on their synovial investment. Acute inflammation ends in increased synovial secretion, which more or less aqueous, is named hydrops articuli; in the effusion of coagulable lymph; in a combination of these two, or the sero-albuminous secretion; in the sero-puriform; sero-purulent; purulent or pus; in ulceration of the synovial membrane, of the cartilages, the ligaments, and the ends of the bones; in the sanguineous effusion; lastly, in anchylosis.

Chronic inflammation terminates in the conversion of the synovial membrane into a gristly substance; in the porcelain deposit on the cartilaginous ends of the bones; in the villous, granular, or gelatinous deposit; the tubercular formation; loose cartilaginous bodies; medullary sarcoma; ichorous synovia; lastly, in anchylosis.

Synovitis.—Acute inflammation; and as the knee is the largest, and probably the joint most subject to disease, upon it I will illustrate their affections. Synovitis, then, of this joint is remarkably common, is excited by the slightest causes, and attacks the rheumatic, the gouty, or any debilitated constitution. On dissection, the synovial membrane is of a dull

colour, injected with red patches of blood-vessels, and sometimes traversed by those of a brown tint, with some degree of pulpiness and thickening.

The chief symptom is acute pain in the joint, aggravated on the slightest motion. The treatment consists in the application of leeches, cupping, fomentations, and a short wooden or iron splint to the popliteal aspect; the patient must be confined to bed or sofa, live on low or moderate diet, and keep his bowels gently relaxed. If in the course of a day or two the pain be not removed, the nitrate of silver, or a sinapism, should be applied over the joint, and repeated if necessary. During their repetition the joint should be poulticed. The splint should be worn some days, even after he is allowed to move about his room, and probably during this time, the foot had better be suspended by a strap over the shoulders. If the inflammation has been produced by a blow, it is always more severe, requires more active treatment, and greater caution before permitting the joint to be used.

Dropsy of joint.—Hydrops articuli, or hydarthrus, is a common sequence of synovitis, indeed, is generally an attendant on it, and is characterized by tumefaction and undulation; the pain is more moderate after the secretion has commenced. Sometimes the patella appears to float in the middle of the joint, at others there is one globular elastic swelling on each side of it, while at others there is only one tumour; these two latter appearances must be the effect of the synovial membrane and fibrous capsule, attenuated by the pressure of the fluid. This is aqueous synovia, and the synovial membrane on dissection presents the same condition as in synovitis. The treatment is the same, except that a succession of blisters is generally necessary. Cantharides are now nearly exploded, because of the febrile excitement and strangury which they induce. Tartar emetic ointment is too tedious in its action, and the different oleaginous counter-irritants, as turpentine, are too mild. After the absorption of the fluid, and removal of the pain, a bandage should be applied from the toes upwards over the knee, and worn for some weeks.

Synovitis occasionally terminates in the effusion of coagu-

lable lymph alone, and lays the foundation for anchylosis; which result must not be prevented, otherwise ulceration might follow, with destruction of the joint and amputation. The symptoms are the same as the first, and so also must be the treatment. On dissection there are the same appearances, with the addition of the lymph here and there coating the synovial membrane.

Anchylosis is the union of the articular surfaces constituting a stiff joint, through the medium either of coagulable lymph, or ulceration and absorption of the cartilages, with caries of the bones. It becomes, therefore, on many occasions a desirable termination. The point to be kept in view, is to place the limb so that, after anchylosis has taken place, it may be as useful as possible; thus the knee-joint should be kept extended as much as the patient can endure. Anchylosis supervenes when a joint remains long unused, as in fractures, fevers, and in old age.

When the sero-albuminous, sero-puriform, or sero-purulent secretion is the termination, the inflammatory action is but a degree more severe than that which ends in the aqueous or albuminous. The symptoms, for the same reasons, are more urgent, and the treatment more active.

When purulent matter is secreted, the inflammation is still more severe, the cause being a violent blow, a wound of the joint, exposure to an intense cold, or smart rheumatic fever. The symptoms are, high inflammatory fever, most acute pain in the joint, with tumefaction, and redness of the skin. Leeches should be applied, and repeated twice or thrice, followed by fomentations and the application of blisters, with rest, low diet, and open bowels. If the joint continue swollen, and the pus be evidently keeping up the irritation, it should be evacuated by a valvular aperture, made on the upper and inner aspect of the patella, and the joint afterwards is to be fomented and blistered. So long as there is active fever, amputation is prohibited. I have seen not a few sink when this operation was performed. The fever must be purely hectic, before such an operation be hazarded.

In all wounds of joints, the symptoms and phenomena are the same as the immediately preceding, with this difference,

that synovia exudes the first day or so instead of pus. The wound should be closed if possible. Here we have the different diseased secretions manifested, as the watery synovia, the sero-albuminous, puriform, purulent, lastly, pure pus welling out at the wound.

In protracted cases of the purulent secretion, the synovial membrane, cartilages, ligaments, and ultimately the ends of the bones ulcerate; but the disease often ends fatally before the bones are involved, or amputation had recourse to. Here the operation is highly proper, the inflammation having become chronic, and the fever hectic.

Chronic inflammation, we observe, sometimes produces ulceration, but much more frequently the acute and chronic stages alternate: thus for example, a great many strumous individuals receive a slight injury of the knee-joint, or expose it to a moderate degree of cold, which excites so little pain, that it is neglected; a chronic action is begun, which, on any exertion, becomes acute, and this, though sometimes judiciously treated, is for the most part the reverse with stimulant embrocations and liniments. The synovial membrane becomes thickened, together with the coverings of the joint, and these latter have effusion of viscid lymph in their cellular tissue. Within the joint, the different secretions are often evinced, as the sero-albuminous, puriform, and purulent, before ulceration ensue; and the latter exhibit the curdly appearance peculiar to the scrofulous habit. Effusion of lymph is now seen in the tissue of the synovial membrane, and in the fibres and interstices of the ligaments, with prodigious external swelling, and turgid subcutaneous veins. This state constitutes what is vulgarly named white swelling. The synovial membrane now ulcerates, the curdly sero-purulent fluid escapes out of the joint, burrows in fistulous tracts, and makes its exit by apertures in the skin. Hectic fever then accompanies the affection. The ligaments and cartilages also ulcerate, and the latter sometimes necrose. Lastly, caries of the articular surfaces of the bones supervenes. In some instances, it would appear that this series is reversed, the disease beginning in the articular ends of the bones, which become carious, and when the purulent matter

forms an abscess in the cavity of the joint, acute inflammation is excited.

It is truly interesting to observe the slow progress in some thus affected, who at last, and often with very little irritation, recover by anchylosis. In the young, it is almost always cureable.

In the commencement, leeches, fomentations, blisters, rest, and moderate diet, and afterwards the tincture of iodine applied with a bandage, are the remedies. Immediately before and after ulceration, the application of the potass or actual cautery, seems preferable to blisters. The potass is equally powerful and efficacious with the actual cautery; it should be broken into pieces from two to four grains, and four of these pieces applied round the patella, and retained with a bandage eight hours. The joint is then to be poulticed daily until the eschars fall off, when the ulcerated surfaces may be dressed with lint wet in warm water and oiled silk. If pain still exist, the intermediate skin should be blistered with the nitrate of silver or tincture of iodine. Long confinement to the splint and bed, or sofa, is indispensable. As long as the health keeps sound, we should persevere; but in the middle of life, when we fail with leeches, fomentations, blisters, and potass eschars, in subduing the pain and constitutional irritation, amputation should be recommended. This operation is the more advisable, if it be a second attack of chronic inflammation and ulceration.

Excision of Elbow-Joint.—Excision is performed, instead of amputation, in the young subject, and in this country is now properly limited to the shoulder and elbow-joints; and the manner of excising the latter is represented in Plate XIII. figs. 2. and 3. The operator should be satisfied that the articular surfaces are carious, since joints have been unnecessarily excised; *vide* Edinburgh Medical and Surgical Journal, Vol. XXXI., page 264, and XXXII., page 236.

The patient should lie on his face on a low table, with his arm gently extended, and supported by an assistant, or he may sit on a chair. The operator makes a crucial incision over the posterior region of the elbow-joint, and dissects back the flaps of the integuments, as depicted in fig. 2., then searches

for the ulnar nerve, and insulates it sufficiently to prevent its being injured, and gives it to an assistant to be held aside by a blunt hook. He now opens the joint, by entering the point of the bistoury between the head of the radius and the outer condyle of the humerus, dividing the outer lateral ligament, and cutting round the olecranon ulnæ, by dividing the attachment of the triceps muscle, and internal lateral ligament. The joint is now so far dislocated, as to enable him to separate rudely the muscular attachments adhering to the bones close to the articulation, and apply the saw, or forceps, with which the diseased ends of the ulna and radius should be first removed, as delineated in fig. 3., and secondly, that of the humerus. Any small arteries, as the recurrents, if bleeding freely, should be secured, the ends of the bones approximated, the flaps stitched, warm water dressings applied, and the fore-arm bent across the chest, resting on a pillow. When suppuration comes on, a pasteboard splint, like that for fracture of the humerus, is to be applied, or a narrow one on each side of the joint, bent to the same angle. The wound should be syringed daily with warm water, and dressed according to its appearance, either with warm water dressing, zinc or copper lotion, and a bandage. The diet ought to be nutritious, and the patient got out of bed as soon as the wound and his strength will permit. The healing process is always remarkably tardy. The ends of the bones and the periosteum secrete callus, which gradually forms an artificial joint, but a very delicate and often useless one. Edinburgh Medical and Surgical Journal, vol. XXXIV., page 225.

Excision of Shoulder-Joint.—When the head of the humerus is carious, we excise it in the following manner. We place the patient on a low table, or seat him on a chair, and make a longitudinal incision about four or five inches from the acromion scapulæ along the arm through the integuments and deltoid muscle, right to the bone, which is next to be divested of its muscular and other attachments, especially the long tendon of the biceps, keeping the bistoury close round the head; this is then to be pushed out of the wound and sawn off. The posterior circumflex artery requires a ligature at this

stage of the operation, but seldom earlier. The lips of the wound are approximated with two or more stitches, warm water dressing applied, and the patient put to bed, with the arm laid on a pillow. In some cases the glenoid cavity of the scapula is involved, and also demands excision, which is performed in the same way; but in doing this we must keep in mind that the supra-scapular artery is hid by the acromion.

Ulceration of Hip-Joint.—The hip, which is subject to the same affections with the knee, when attacked with chronic inflammation, suppuration, and ulceration, is said to labour under *morbus coxarius*. This attacks the young most, especially rambling boys, and is often very tardy and insidious; the sufferer begins to limp and feel pain in his knee, with slight lengthening of the limb and eversion of the toes; and as the disease proceeds, the pain increases, and is seated in the groin and hip, which latter has now a flattened appearance. The pain becomes ultimately so acute, that he bends his body forwards and to the side, producing curvature of the spine. The limb is shortened by the power of the extensors, and the knee and toes inverted by the adductor muscles. The posterior aspect of the joint or hip is much swollen; the pus within the joint having burst out, soon forms one or more fistulous tracts, which burrow even within the pelvis; the acetabulum in some instances ulcerates through. Hectic fever and death follow. Dissection exhibits the same phenomena that are observed in the knee-joint, with the difference of there being marked luxation. The treatment is the same, only setons behind the trochanter major, and in the groin, seem here more beneficial.

The pain felt at the knee is evidently from the stretching of the nervous threads of the anterior crural nerve, particularly when there are swollen lymphatic inguinal glands, and is not to be ascribed to the obturator nerve, rectus muscle, or sympathy. At first, the pain is sometimes at the groin, knee, along the outside of the limb, and in the foot; and when the trochanter is pressed upon, or the knee or foot pushed upwards, the pain is increased in the hip-joint. To prove there is displacement of the head of the thigh-bone, Richerand adduces a case where it was on the obturator foramen; and Le-

veille, one where it was on the dorsum of the os ilium. It is surprising how long some patients continue to walk about while labouring under this malady. Excision of this joint has been attempted by Mr Hewson, of Meath Hospital, Dublin, but his patients died.

In a case of anchylosis consequent on acute inflammation from external injury, Barton, of Philadelphia, formed an artificial joint, by making a crucial incision over the cervix and trochanter major of the thigh-bone; and divesting the cervix of its soft attachments, he inserted a saw, and divided this part of the bone; no vessels were wounded. The wound was stitched, and in the course of two or three weeks, passive motion performed. The patient was a young sailor, and had a useful limb restored to him.

Ulceration of Atlas and Dentata.—The joints of the vertebral column, subject to the same maladies as other articulations, present a peculiar train of symptoms, when those connecting the atlas with the occiput, and the former with the dentata, are attacked with chronic inflammation, suppuration, and ulceration. The individual complains of pain in the back of his neck and head, with difficulty of swallowing, and generally imagines that he has no more than sore throat produced by cold. The disease advancing, pain is experienced on taking a deep inspiration; the difficulty of swallowing, which is the most characteristic symptom, becomes painful; and there is violent headache, with heaviness and fulness of the eyes, disturbed sleep, and considerable irritative fever. Convulsive twitches come on, with paralysis of one or more of the extremities, and death. Some have fallen victims, while walking and supporting their heads with their hands. There is a peculiar expression of pain in the countenance, with large full eyes, a dread at moving the head, which generally inclines to one side, and that commonly the left, and when moved, acute pain darts to the larynx and left scapula. On dissection, there is not only inflammation and ulceration of the synovial membrane, ligaments, and cartilages, and the bony structure of these joints, but pus in the vicinity, between vertebra and pharynx, and the latter ulcerated, serous effusion under arach-

noid, and in ventricles of the brain and spinal canal; the dura mater and theca vertebralis in the vicinity of the foramen magnum, livid and ulcerated, and the cervical portion of the spinal cord in a state of mollescence. The transverse ligament of the atlas is commonly destroyed, and the processus dentatus ulcerated away. I have several preparations illustrative of these facts.

The treatment consists in confining the patient to bed with steel stays, together with the chin stay; in leeching or cupping; in applying numerous pieces of potassa from time to time, or two or more setons at once to the nape of the neck; in moderate diet and easy bowels.

Ulceration of Sacro-iliac Joint.—The sacro-iliac junction, when seized with chronic inflammation, suppuration, and ulceration, presents symptoms and appearances somewhat resembling those of morbus coxarius; there is pain in the haunch or thigh for some days, the limb is longer or shorter, and the patient walks with difficulty. The contour of the haunch becomes slightly swollen, and even the whole limb; and the pain increases, so that he is at last confined to bed. When the limbs are compared at the trochanters, knees, or ankles, there is no difference in length; but if a line be drawn across or horizontally to the cristæ of the ossa ilium, they are not on the same level, that of the affected being either above or below the horizontal plane of the sound side.

This affection is very slow, sometimes lasting months and even years. It is, however, occasionally acute, and very rapid. There is a case described of a dragoon, who, while on horseback, observed his leg become longer by two inches, and on dismounting and walking a little, found it shorter by an inch and a half than the sound limb. The pain became insufferable as the limb lengthened. I have seen this malady in carters and millers, from falls and over exertion, and in young gentlemen from blows with a cricket ball. The suppuration and sinuses are the same as in morbus coxarius, and so also should be the treatment. Dissection exhibits the same extent of disease.

Villous Deposit.—The villous, granular, or gelatinous deposit, is a very common result of chronic inflammation in the scrofulous joint, particularly the knee, and is never wanting if the disease be of long standing. It is a delicate pulpy substance like velvet, first secreted at the angle of reflection of the synovial membrane, on the margin of the cartilaginous surfaces, and thence extending chiefly over the latter. When injected it is very vascular. In such cases, the inflammatory action often alternates from the chronic to the acute, and there is the curdly purulent fluid. It is irremediable, and could we be aware of its existence during life, the sooner amputation were performed the better. Being ignorant of its presence, we treat it as recommended for chronic inflammation and ulceration of the cartilages, see page 161.

The conversion of the synovial membrane into a gristly condition is very slow, and evinces no symptoms during life, further than want of activity, and for which a laced knee-cap is applied.

The porcelain or porcelaneous deposit is only found on the surfaces of the bones, and so resembles porcelain, that one would imagine it to be manufactured. It is discovered most on the hip-joint, and in advanced life, but exhibits no peculiar symptoms.

The tubercular deposit is found in those who have laboured some years under chronic action of the knee-joint, from time to time, until at last acute inflammation has been excited, ending in sanguineous and purulent effusion. The treatment must be the same with that recommended for chronic inflammation in page 161, and for the acute in page 157.

Medullary sarcoma is rather an uncommon disease of the joints, and is mostly confined to the hip ; it is incurable, but when situated in a more remote joint, life can be saved by amputating the limb. The nature of this adventitious deposit will be described under tumours.

The ichorous synovial secretion is rare, and the same may be said with regard to sanguineous effusion. I have only seen the latter an attendant on the tubercular deposition, and in the rheumatic joint, consequent, however, on a blow.

Loose cartilaginous bodies are found chiefly in the knee-joint,

and vary in number and magnitude, and must be secreted by, and connected to, the synovial membrane, until detached by the motions of the joint. They soon lame the individual, by getting between the convex condyles and the head of the tibia. When of but small size, they are readily discovered, and should be confined at one corner of the joint by the laced knee-cap, or a bandage rolled round in the figure of 8. If this do not enable the person to follow his occupations, they should be excised. Previously to doing which, he should be dieted and confined to bed three or four days; then the cartilage is to be fixed by the fingers of an assistant at one side or corner of the articulation, and an incision made over it, through the integuments, fascia, tendinous expansion, fibrous and synovial membranes, and the object seized with a pair of nasal or common forceps; the wound instantly closed, stitched, and warm water dressing, with a bandage over all. Smart inflammation generally follows, and ought to be carefully watched.

The semilunar cartilages, especially the outer or fibular, are now and then out of their situation, from relaxation of their short ligaments, and lame the patient in the same way as these detached cartilages do, so that he cannot extend his limb. Hydrops often accompanies this in the feeble and relaxed. By bending and rotating the joint, the thigh tibiad, and the foot fibulad, we can without much difficulty reduce them. The limb is next to be extended, and they are then to be retained *in situ*, by a roller or laced knee-cap.

DISEASES OF THE SYNOVIAL BURSÆ.

These pouches are prone to nearly the same diseases with the joints, namely, acute and chronic inflammation, and their terminations and deposits. There are increased synovial secretion, sero-albuminous, sero-purulent, and pure pus, supervening to the acute action; there are ulceration and purulent secretion, the conversion of the membrane into a ligamentous, and also a cartilaginous substance, loose cartilaginous bodies, and hydatids, the result of the chronic stage. The treatment for all of these affections is almost the same with that for the joints.

When the bursa over the patella is attacked with acute inflammation, the treatment is the same as that recommended in page 158. for synovitis, only modified; but when suppuration has succeeded, free incision, for it is then only an acute abscess. When the abscess is chronic, it is to be treated by seton; here the seton needle is the preferable instrument, and should be passed longitudinally, parallel with the leg. In the course of three or four days, when the wounds are in active suppuration, the cord should be reduced in thickness as directed in page 117. for vascular tumour, otherwise the pus burrows on each side of the patella, requiring counter openings.

When the larger series of bursæ, as that under the deltoid or gluteus maximus, is affected with chronic abscess, a puncture of the bistoury should be made, as the pouch is too large to be treated with seton. That under the insertion of iliacus internus and psoas magnus muscles, requires the same method, but it so resembles psoas abscess or hernia, that we must be circumspect in our diagnosis.

Hydatids are found in these large bursæ. Substances like small melon seeds, said to be condensed coagulable lymph, but evidently cartilaginous bodies, are often found in the synovial pouch under the palmar annular ligament of the wrist-joint. They are in great numbers. This bursa should be punctured with a bistoury on the proximal aspect of the wrist, these bodies evacuated, the sac roused to action by a director, and freely rubbed on its inner surface; a compress applied in the hand with a bandage. When the bursa over the olecranon ulnæ is distended with fluid, it may be mistaken for dropsy of the elbow-joint; when the bursa under the deltoid is diseased, there is often a communication with the shoulder-joint at the bicipital fossa; and a similar connexion as frequently exists between the bursa under the psoas tendon and the hip-joint, which renders disease of these two last bursæ very serious. The bursa superficial to the larynx is sometimes affected, and when it is allowed to rupture, sinuses form; that over the angle of the scapula now and then becomes diseased, and so also that under the tendinous insertion of the sartorius and gracilis muscles.

A species of spurious or adventitious bursæ is apt, in pecu-

liar situations, to be generated or called into action by pressure and friction; for example, in the integuments over the ball of the great toe, over the patellar ligament, and in the club foot, where it rests upon the ground. That on the tibial or inner side of the great toe seems gradually to multiply, or rather one bursal pouch is formed upon another, constituting what is named a bunion. The lateral ligament of the joint has a compact laminated structure, the laminæ dense towards the bone, and less so towards the skin, as if bursæ had successively formed, or were forming, as fast as the outer one was obliterated. In many instances, the head of the metatarsal bone is changed, the cartilaginous surface being covered with warty granulations. The tumour inflames, becomes exceedingly troublesome, and even causes lameness; it occasionally suppurates, involves the joint of the toe, and leads to amputation. At first, by fomentation and rest, and afterwards the application of the nitrate of silver in the dry state, and the wearing of a wide shoe, with the sole thicker towards the tibial aspect of the foot, all these evils may be averted.

LUXATIONS.

Luxation consists in the bones of a joint being displaced, and, like fracture, may occur from violence, the action as well as the relaxation of the muscles and ligaments, and disease. Violence is by far the most frequent cause; the action of the muscles must be powerful to produce this effect; relaxation of them occurs but in very infirm habits, and disease, as we have already seen, is a cause only when it has existed some time, and ended in ulceration.

Luxation is divided into simple, compound, primary, consecutive, complete, incomplete, and subluxation. Simple, when the integuments are entire; compound, when these are wounded; primary, when the bone displaced remains fixed; consecutive, when this shifts its situation; complete, when the dislocated bone is out of its socket; incomplete, when not; and subluxation is the same with the last; so that these might be condensed into simple, compound, and incomplete. Simple,

primary, and complete, are the same; incomplete and subluxation are one and the same; and consecutive is denied, and justly so, by many good surgeons; compound is evident.

Luxation of Shoulder-Joint.—Dislocation of the shoulder-joint is probably that which illustrates this accident best, and occurs most frequently. It takes place in four different directions, as for example, into the axilla, on the ribs, on the dorsum of the scapula, and on the coracoid process; that into the axilla being much the oftenest.

When the head of the bone of the arm is forced into the axilla, there is a marked depression under the acromion scapulæ, the arm is semi-bent, the patient supports it with the sound one, and rests it on his thigh or pelvis, and generally complains of a good deal of pain. The surgeon cannot raise it to a right angle with the body, and the attempt aggravates the sufferings. In a day or two, sometimes considerable œdematous swelling supervenes.

Dissection exhibits the fibrous capsule torn, the short muscles around the joint lacerated, and even some of the longer, as the coraco-brachialis, with the head of the humerus on the margin of the subscapularis and inferior costa of the scapula, and sternad to the long head of the triceps.

The treatment is to lay him on a sofa, apply a damp bandage to the arm above the elbow-joint: over this a skein of worsted, secured with the sailor's double clove hitch, and the noose or loop over the shoulders of the surgeon, who puts his heel in the axilla, as also a pad, and then begins to extend slowly, Plate X., fig. 1. An assistant grasps the elbow and wrist with his hands, and rotates gently. A gurgling or snap tells when reduction is accomplished; the operator should then suddenly cease extension, put the arm across the chest, remove the worsted and damp bandage, but retain the pad in the axilla, bind the arm to the side, give support to the elbow, and let the patient retire to bed.

The arm should remain unused some days for fear of inflammation, as this with suppuration has supervened; and it should never afterwards be raised above a right angle with the body, otherwise the dislocation will be reproduced. In those in-

stances where there has been extensive laceration of the muscles, the patient seldom recovers the full use and power of the arm.

When this luxation is neglected, the glenoid cavity is gradually filled with a soft fibro-cartilaginous substance, the fibrous capsule heals up, the head of the humerus forms a new bed for itself, which becomes cartilaginous, and even ossific, the muscles around form a rude fibrous capsule invested with synovial membrane, and the long muscles, together with the short, contract, become rigid, and accommodate themselves to their new functions. Even the nerves and blood-vessels appear to do the same. From these facts a question naturally suggests itself, within what time is reduction prudent? Experience proves that three months is the longest. I have succeeded at eleven weeks; but this must depend much on the age of the patient. In the prime of life we may use more freedom than in old age; in the latter I would advise great care at the end of two months. When an attempt has been made at a more distant date, extensive ecchymosis, violent inflammation, with suppuration, and destruction of joint, have followed; emphysema has supervened; the axillary artery has been torn; the axillary plexus of nerves destroyed, even torn from their origin the spinal cord, with immediate death. The deltoid muscle is often paralytic for weeks after reduction, then acupuncture, rubefacients, and blisters, with strychnia, are of great service.

In a strong muscular man, after the luxation has existed but a few days, the pulley apparatus, instead of the heel and strength of the surgeon, are indispensable; nay, it is necessary to excite nausea with small doses of the tartrate of antimony, and even this with a hot bath, before having recourse to this apparatus. The pulleys, see Plate X., fig. 4, are used as follows: The patient is placed on a chair, with the bandage and worsted round the arm as before, and to the worsted is affixed one of the hooks, while the other is attached to a rope round a piece of wood or poker across a window outside of the house, to act as a counter extending point. A broad sheet is to cross the affected axilla, and to be fixed in a similar way to the other side of the room. All being thus

adjusted, an assistant gently pulls the cords of the pulley apparatus, while the operator rotates the fore-arm and guides the head of the humerus by a pad in the axilla resting on his knee, his foot on the chair of the patient. Whenever the head of the bone is raised opposite to the glenoid cavity, the muscles pull it into its socket, with a snap or gurgling noise. It is remarkable that the muscles, which formerly assisted in producing the original dislocation, here favour reduction, and in each instance on the same principle. The delicate female acquires such mobility of the limb, in the course of two or three weeks after luxation, as to raise it to the back of her head, and hence renders the diagnosis difficult.

There are various other modes of reduction not necessary to be particularized.

After the head of the os brachii has been forced into the axilla, some think that the muscles have the power to pull it upwards on the ribs near the clavicle, and make a consecutive dislocation; but this is very questionable; it is more natural to suppose, that it is primary either by a single severe blow, or by two or more strokes in succession. Larrey relates an instance of the head of this bone being forced into the cavity of the thorax, between the second and third ribs.

The other directions of this luxation have all the conspicuous depression under the acromion, and so nearly the same are the other appearances and symptoms with that into axilla, and so similar the treatment, that it would be superfluous to describe them individually. That on the infra-spinal fossa has a tumour close to the spine and acromion scapulæ; that on the venter scapulæ is with difficulty distinguished from that in the axilla; and that on the coracoid process, but one instance of which I have seen, has a swelling at its root, and close to the clavicle.

Compound luxation here, if it happen, may require excision of the protruded humerus, the securing any small arteries, approximating the wound with stitches, warm water dressing, rest, low diet, and confinement. If complicated with fracture of the head and neck of the bone, amputation might become a question with the surgeon.

Simple luxation, with fracture of humerus either at its cer-

vix or middle, now and then occurs, in which case we should first endeavour to reduce the dislocation, and then set the fracture; but in this we generally fail, as there is no purchase for extension, and we are therefore compelled, first to unite the fracture, and next attempt reduction. Eight weeks at least must be allowed for the union of the bone, after which the arm being well protected with pasteboard splints, reduction may be tried. I have seen one instance where reduction was first accomplished, and then the fracture set; but the individual had had the joint previously displaced, in which case reduction, as well as dislocation, readily take place.

Luxation of Clavicle.—The scapulary end is often raised above the acromion: here the outer fibrous ligaments of the joint are lacerated, the coraco-clavicular ligament remaining sound. On tracing the spine of the scapula, a projection is felt, and on grasping it with the one hand, and the clavicle with the other, we ascertain the separation. The arm is to be placed in the position for fractured humerus, delineated in Plate IX., fig. 4., a compress on the elevated end of the clavicle, with a bandage round the shoulder, and the patient confined to bed two or three weeks.

The sternal end of this bone is sometimes dislocated, and projecting either upwards or forwards, is easily seen. Here the outer fibres of the joint, the interclavicular, and often the rhomboid ligaments, are torn; hence a strong joint is seldom restored. The arm is to be put in the same position with the preceding, a large compress over the detached end, and a roller over all; the patient confined to bed two months, and the arm kept quiet four months.

Luxation of Elbow-Joint.—The elbow-joint is dislocated commonly backwards, or the heads of the radius and ulna behind the trochlear surface of the humerus, as represented in Plate X., fig. 2. Diagnosis is difficult here, (see pages 146. and 147. for fractures in the vicinity.) The lateral, anterior, and posterior ligaments, and the brachialis anticus muscle, are torn; the fore-arm is extended, and cannot be bent, and there is the olecranon projecting on the posterior or anconal aspect

of the arm, with sometimes a similar tumour made by the head of the radius.

When recently luxated, it may be reduced, by seating the patient on a chair, with his back towards the surgeon, an assistant making counter-extension with his hands round the axilla, while the surgeon makes extension at the wrist, placing his foot on the chair. Whenever any snap or gurgling noise is heard, the fore-arm is to be suddenly bent on the arm, and carried across the chest, and retained with a bandage or handkerchief. During two weeks no motion should be allowed.

If the dislocation be of a few days standing, the pulley apparatus should be applied. In the course of three weeks, we generally fail in reducing this luxation, apparently from the coronoid process indented in the greater sigmoid or olecranon cavity of the humerus, and the contraction of the muscles.

Compound luxation here is not unfrequent, and then it is complicated with fracture of either one or both condyles of the humerus, and occasionally of the olecranon ulnæ. We must remember the observations regarding fractures of the upper extremity in page 147. Remove the fragments, or excise the protruded bones; put the sawn surfaces in apposition, as described under excision of elbow-joint, page 161, with the other after treatment. Fomentations are requisite. If there be comminution of the bones, with destruction of the soft parts, amputation is necessary.

The displacement of radius and ulna forwards or palmad to humerus, even with fracture of olecranon, may be passed over, in consequence of its rare occurrence. Delpech saw one instance without fracture.

Radius alone is sometimes forced palmad on the external condyle of humerus, and is ascertained to be so by a little examination; it is easily reduced, but with difficulty kept *in situ*. The fore-arm is to be bent, a compress applied on the projection, with a roller in the figure of 8, as represented in Plate II. fig. 6. This bone is also forced anconad or backwards on the humerus, in children, and is readily distinguished, except that it may be mistaken for fracture of outer condyle, see page 146; considerable extension is requisite, and there is difficulty

keeping it in its place; when reduced, the arm is to be kept extended, with a splint on the palmar aspect, previously applying a compress and bandage, just as in the preceding luxation.

The ulna alone is now and then forced backwards or anconad to the humerus, and then the symptoms somewhat resemble those of the displacement of both bones; in this there is pronation of hand, with a semi-bent position of fore-arm; it is liable to be confounded with fracture of inner condyle, (see page 146.) Reduction is more easily accomplished than when both ulna and radius are dislocated, and is performed in the same manner, and the treatment is the same.

Luxation of Wrist-Joint.—This articulation is frequently so injured, the carpal bones being forced on the posterior or anconal aspect of the radius and ulna, and readily recognised. Fracture of this end of the radius may deceive us at first, (see page 146,) but never sprains; counter-extension being made above the elbow-joint, we extend at the hand, and when reduction is effected, put a pasteboard splint on each side, the fore-arm across the chest, slung in a handkerchief.

The pulley apparatus is often useful in this accident. Compound luxation is generally so severe, that amputation must be kept in view.

When the carpal bones are forced on the palmar aspect, the fingers are extended backwards, and there is a peculiar angle formed between the ulna and radius, and carpal bones, on the posterior or anconal aspect. To be treated like the preceding luxation.

This extremity of the radius may be displaced alone, on the palmar aspect of the carpus; and even on its radial aspect, its styloid process piercing the skin: either is readily observed, and is to be reduced and treated accordingly.

The carpal end of the ulna has been displaced singly, but this displacement is oftener combined with fracture of the radius at its distal extremity. It is found on the anconal aspect of the wrist, when luxated alone, and on the palmar aspect when accompanying the fracture. To be reduced and treated as that of the wrist-joint.

One of the carpal bones, as for example the os magnum,

has been forced on the back of the hand. It is easily recognised, but with difficulty reduced and kept in position. This is done by bending gently the hand, and pressing on the bone, and afterwards applying a compress and bandage. The os cuneiforme is more easily reduced.

Compound dislocation of these bones is generally so severe, as to require extirpation of one or more, or even amputation. (See fractures of them at page 147.)

Luxation of Fingers.—The thumb may be said to be the only digit luxated at the proximal extremity of its metacarpal bone, and this either palmad or anconad. It is readily ascertained, but with difficulty reduced. A piece of soft leather is to be put round the contiguous phalanx, over this a piece of strong tape in the form of the clove hitch, by which extension is to be made, counter extension being made at the wrist, or between the thumb and fore-finger. When reduced, a compress and bandage are to be applied.

When several weeks have elapsed, it becomes necessary, before reduction can be effected, to divide the fibrous capsule on the anconal aspect, with a narrow sharp-pointed bistoury.

In compound luxation we attempt to save the finger, if the long tendons are uninjured.

The first phalanx is now and then dislocated from the head of the metacarpal bone, in any of the fingers, especially the thumb, and this either palmad or anconad. It is easily distinguished and reduced.

Compound luxation is to be treated in the way recommended above for the thumb.

The same observations are applicable to the remaining articulations of the fingers, whether the luxation has been simple or compound.

Luxation of Hip-Joint.—This joint is dislocated in four directions, upwards on the dorsum of the ilium, upwards and backwards on the great sacro-sciatic notch, downwards on the obturator-foramen, and upwards and forwards on the os pubis. The first dislocation is by much the most frequent, and is discovered by the shortening of the limb, inversion of knee and

toes, with the latter resting on the great toe of the sound limb. If recent, and without much tumefaction, it is quite palpable. The same structures are injured here as in the shoulder-joint, but the strong pubic fibres of the capsule remain entire, and assist in inverting the limb. The patient is to be laid on his side on a bed on the floor, with a pad and strong sheet round the perineum, which is to be tied to some fixed point; a wet bandage is then to be rolled twice or thrice round the thigh immediately above the knee-joint, and over this the worsted in the figure of the clove hitch, see Plate X., fig. 3., to which is to be hooked the pulley apparatus, the other end of which is fixed to another point; all being thus adjusted, an assistant begins to pull very slowly and regularly the cords, while the surgeon, grasping the thigh and ankle, rotates the limb, with the intention of moving the head of the os femoris so as to facilitate the reduction. When reduced, the limb should be tied to the sound one with two handkerchiefs, and the patient confined to bed one or two weeks. If no pulley apparatus be at hand, an attempt should be made with the heel in the perineum, as recommended for that of shoulder-joint at page 169.

Reduction ought not to be attempted beyond eight weeks, for reasons mentioned in page 170.

Dislocation of this joint is sometimes complicated with fracture of the os femoris. To be treated as recommended in page 172. for that of the os brachii.

Compound luxation seldom or never occurs.

When the head of the bone is forced on the great sacro-ischiatic notch, the symptoms are so nearly the same with the former, that I am convinced we are often deceived between them. In this, there is a little more shortening and inversion of the limb, the great toe resting on the tarsus of the sound foot. Reduction is performed in the same way, but as extension proceeds, an assistant is to raise the limb, with a broad sheet round the thigh close to the hip-joint, the ends over his own shoulders.

Luxation into obturator foramen, the next in frequency, presents a lengthened limb, with eversion of the toes, and stooping forwards of the patient to relax the overstretched

muscles, nerves, and blood-vessels. This has been mistaken for fracture of neck of os femoris, but the age of the patient and the violence of the injury should guide us; here the individual is under 50 years, and no fall of his own height will produce such a displacement. Reduction can generally be effected by placing the patient on his back, grasping the ankle, and cautiously adducting the limb, while the knee is placed on the inside of his thigh close to the hip-joint, to act as a fulcrum. When we employ the pulley apparatus, and make extension, no sooner does the head of the bone come near the acetabulum, than the muscles pull it on the dorsum of the ilium, thus making a second or consecutive luxation.

The last direction is very rare, viz. that on the body of the os pubis, I have seen but one instance. The limb was shortened, toes everted, a tumour on the groin, and a marked congestion of the cutaneous venous circulation, the limb being purple: this was from the head of the thigh-bone pressing on the crural vein, but in general it is forced outwards or iliac to the great vessels, and pulsation of the artery can be distinctly felt, with a conspicuous tumour on its pubic aspect, without discoloration of skin. It is reduced with comparative ease by extension, and pressing on the thigh near the joint.

Luxation of Knee-joint.—First, of the patella. This bone is seldom dislocated, and almost always laterally, and fibulad; it is readily observed by the projection at the knee, and the extension of the leg. To be reduced by bending forwards the body and extending the leg, and then pressing forcibly on the raised margin of the bone. It has been proposed to reduce it by sudden flexure of the joint; but this is improper. From the laceration of the synovial membrane, there is ecchymosis and inflammation of the joint, which must be treated accordingly, see page 157. After a cure, the laced knee-cap is to be worn. In displacement upwards the patellar ligament is torn; and in that downwards, the quadriceps muscle is lacerated.

The tibia is seldom displaced from the condyles of the os femoris, but it may in the four diagonal directions, and if

to one side, the luxation is incomplete. Either is readily recognised, and from the destruction of the ligaments, with facility reduced. Considerable inflammation supervenes, which must be actively treated, see page 157. The dislocation backwards may be mistaken for fracture of thigh-bone into knee-joint.

Compound luxation of this joint is commonly so severe as to demand immediate amputation.

Luxation of Fibula.—The head of this bone is sometimes displaced forwards, backwards, and even upwards; one instance is mentioned of its being torn from all its ligamentous and muscular connexions, and forced directly upwards towards the thigh. It is, for the most part, accompanied with fracture in the middle, with or without fracture of the tibia. It is with difficulty reduced, and with no less difficulty held *in situ* afterwards.

Luxation of Ankle-Joint.—This occurs in the four diagonal directions, that outwards being the most frequent; in which instance, the foot is twisted out, the individual resting on its tibial margin, or almost on the malleolus internus, so that the nature of the injury is quickly perceived. Here fracture accompanies the dislocation, the tibia being broken immediately above its malleolus, or the latter is broken, and the fibula, one or two inches higher up; the fibrous capsule, a portion of the deltoid, the outer lateral, with the whole of the inter-transverse ligaments, are torn. Reduction is easily made, from the fractured condition of the bones. The limb should be put on Liston's splint, and assiduously fomented, because considerable inflammation and tumefaction supervene.

The luxation in the other lateral direction is next in frequency, and here the foot is inverted, the patient resting on its fibular margin, or almost on the outer malleolus. The injury of the bones and soft parts is nearly the same, and so also is the treatment.

Luxation without fracture is rare; I have only seen one of each. That outwards, from the laceration of the deltoid ligament and fibrous capsule, occurred to an old lady falling off a

chair the height only of eighteen inches, or two feet ; and that inwards, from the laceration of the three slips forming the external lateral ligament and the fibrous capsule, to a young lady who fell from horseback ; here however it was compound.

Luxation forwards, or that wherein the foot has an unusual lengthened appearance, is very seldom encountered ; here the fibrous capsule and lateral ligaments are torn across, and the tibia and fibula forced backwards on the os calcis. Only one instance has come under my own observation,—a young man who fell from a window about twelve feet high. It is at once observed, and reduced without much difficulty. Counter-extension being made above the knee-joint, extension is to be made at the heel and toes, when the muscles drag in the astragalus ; but if not, pressure should be made on the tarsus, downwards and backwards. Considerable inflammation, with tumefaction and vesication, followed in the case alluded to; but by assiduous fomentation and elevation of the foot, which was put on M'Intyre's splint, the case did well.

Luxation backwards is very uncommon ; only one instance of this have I seen. The tibia and fibula are forced forwards on the naviculare, giving the foot a shortened or club appearance ; the lateral ligaments and fibrous capsule are lacerated. To be reduced as the immediately foregoing, only making pressure on the tarsus in the opposite direction. The after treatment is the same.

Compound dislocation is very common, and may be treated as compound fracture, see page 140. The case is always tedious from suppuration, the pus burrowing in the vicinity, and requiring counter openings, and portions of bone or even the ends of the shafts necrosing. Not unfrequently violent erysipelas phlegmonodes arises, requiring active treatment, see page 37.

A very frequent compound luxation of this joint, or rather a compound fracture of astragalus, is, this bone broken transversely and forced through the integuments along with one or both of the malleoli. The nature of the injury is very apparent ; it is to be treated by sawing off all the bony protrusion, reducing the tibia and fibula, stitching the wound, putting the limb on Liston's splint, and treating it as recom-

mended in pages 179 and 140. A young man personating the Duke of Wellington in the battle of Waterloo on the stage, fell from his horse, and produced this accident; he was treated as thus described, and can now walk several miles without fatigue, and without the injury being observable.

The displacement of the astragalus by itself is not unfrequent, and commonly compound. It is at once perceptible, and can generally be detached with a bistoury. To be treated afterwards as the immediately preceding.

In these cases, where so much bone is removed, nature shoots forth granulations from the contiguous ligaments and surfaces of bones, filling up the joint, and forming a soft anchylosis, which is prevented hardening by passive motion. It is only however in the young and vigorous constitution, that we can look for so favourable an issue; in the individual past the prime of life, we must think of amputation.

When simple, this bone is generally forced forwards on the patellar aspect of the other bones of the tarsus; one case however occurred lately, where it was driven backwards behind the tibia, between it and the os calcis. This was produced in a muscular athletic man, by a fall down stairs. All attempts at reduction were unavailing; the limb was repeatedly leeched, inflammation kept down, and a useful limb restored. The astragalus was much diminished by absorption.

In one or two of those cases where the astragalus was driven on the patellar aspect of the tarsus, the skin sloughed, the bone exfoliated and was extracted.

This bone has been in a few instances wedged between the tibia and fibula, the intertransverse ligaments being torn, and generally the tibia fractured in the contiguity. The limb is shortened, the ankle-joint is greatly swollen, and crepitus is heard. Reduction is accomplished by extending with a little force at heel and toes. The remaining treatment is the same as recommended for fracture, see page 139. Several weeks must be allowed to elapse, before gentle or passive motion be permitted.

Luxation of the Bones of the Foot.—Dislocation of the

other tarsal bones is rare; the foot has been torn across, and partial amputation has been necessary.

Luxation of the tarsal ends of the metatarsal bones seldom occurs without so severe injury of the soft parts, as to require amputation. There is always great tumefaction, as in fracture, see page 142, and the treatment is the same.

The distal heads of these bones are occasionally displaced individually and collectively, and generally into the sole of the foot. If swelling has not taken place, the nature of the accident is soon discovered, and is easily remedied by extension. When compound luxation exists, amputation is demanded. The phalanges are now and then dislocated; the injury is quite evident, and they are easily reduced.

Compound luxation generally requires amputation, particularly if the flexor tendons are injured.

Luxation of inferior Maxillary Bone.—One or both condyles may be displaced forwards, and the disfiguration of the countenance produced, shows the nature of the injury. By inserting the thumbs protected with gloves into the mouth well backwards on the molar teeth, and raising the chin with the fingers, we effect reduction. The operator, for his own sake, should glide his thumbs aside, between the teeth and cheeks. A four-headed roller should be applied round the chin and head, and the patient live on slops a week or two. Compound luxation seldom or never occurs.

Luxation of Vertebræ.—Until lately these bones, with the exception of atlas and dentata, were supposed to be incapable of being dislocated without fracture. The cervical are those most frequently luxated, and sometimes only one of the articular from its corresponding process, illustrating subluxation; at other times, both articular processes from their connexion; while at others, these processes together with the body. In each of these, the spinal cord and membranes are more or less injured, so that there is some degree of paralysis. Diagnosis is fully as difficult here, as in fracture, see page 150. The treatment in such cases ought to be the same as that recommended for fracture. Rust, however, cites cases of suc-

cessful reduction, while others killed their patients in the attempt.

The dentata has often been dislocated from the atlas by rupture of the perpendicular, transverse, and lateral or moderator ligaments. In some the transverse has remained entire, while the processus dentatus has slipped below or sacrad. In all, death instantly ensued.

Luxation of Bones of Pelvis.—The violence producing their displacement is for the most part so great, that a fatal result follows at no distant time. If he survive a few days, there is inflammation of the contiguous soft tissues, or extensive suppuration. The symphysis pubis has been separated; the ossa ilium driven forwards and upwards, and upwards and backwards; and the sacrum into pelvis towards the pubes. One or two solitary instances are recorded of patients recovering from luxation at sacro-iliac synchondrosis; in one the left os ilium was forced upwards, and could not be reduced until the individual began to walk on crutches. Another, a patient of my own, a stout young man, fell about 35 feet, dislocated his right sacro-iliac junction, and fractured the tibia and fibula into the ankle-joint of the same side; he lay seemingly moribund for two or three days on a bed on the floor; a broad flannel roller was put round his pelvis, and the leg placed on M'Intyre's splint. During the cure, the integuments over the luxation sloughed extensively, (which I believe saved him,) and a communication took place between the rectum and urinary bladder, the fæces and flatus passing more *per urethram* than *per anum*. He was living five years after the accident, and could walk with the assistance of a stick. The leg was long paralytic. The treatment of such injuries is by a broad belt, with attention to the urinary bladder and bowels. Leeching and cupping, and even counter-irritation, may be necessary.

The coccyx is seldom dislocated, but when it does occur, it is either inwards towards the pelvis, or outwards, and is easily ascertained by the insertion of the finger into the rectum. It is reduced with ease, like its fracture, see page 151.; but it often returns of itself to its natural situation, during the use of leeches, fomentations, rest, and relaxed bowels.

Luxation of the Ribs.—These are, strictly speaking, only displaced from their cartilages, the latter overlapping them; for luxation of their cartilages from the sternum seldom or never takes place, and their vertebral extremities equally seldom; fracture of their bodies occurring much more readily. The treatment is to desire the patient to draw a deep inspiration, and then the projecting cartilage is to be replaced, a broad flannel roller applied round the chest, as in fracture, and inflammation watched. See page 152.

The ligamentous band connecting the cartilages of the sixth, seventh, eighth, and ninth ribs, at their angles, are sometimes torn, and the upper overlaps the under rib. To be treated in the same way.

SPRAINS, GANGLIONS, AND MALFORMATIONS OF JOINTS.

Sprains—Consist in the laceration of the fibrous and synovial sheaths of the tendons round a joint, by which the muscles are diminished in their power. The extensor tendons on the back of the wrist often tear up their vaginal confinement, when a person falls on the hand. There is a globular swelling produced, but not for an hour or two; acute pain, particularly on moving the wrist-joint; and hence, if there be a globular tumour on each side of the joint, the injury may be mistaken for fracture or dislocation, which is no uncommon occurrence with the careless or uneducated.

The treatment is, by assiduous fomentation, rest, and elevating the hand on a pillow. Leeches, by exciting erythema, do harm. When all acute action has been subdued, a bandage, with stimulant friction, should be applied, and the former worn a considerable time. From the synovia constantly exuding, and preventing re-union of the fibrous part of the sheath, the arm seldom regains its original strength, especially when the posterior annular ligament is lacerated. The sheaths of the extensor tendons of the thumb often suffer.

The tendons round the ankle-joint are frequently sprained, and from the weight the limb has to support, are more diffi-

cult of cure; the slightest over-exertion causes a recurrence. Sprains, therefore, are more serious than either luxation or fracture. Long confinement to the horizontal position should be enjoined, to accomplish a re-union of the fibrous sheath as strong as possible.

When the latissimus dorsi is torn from its attachment to the inferior angle of the scapula, it never re-adheres, or re-acquires its power over the arm, in consequence of the synovial bursa situated there. The muscle slips down or sacrad of this angle of the bone, and the shoulder falls forwards, imparting an awkward appearance to the figure, and infirmity to the extremity. The treatment is fomentation; rest in the horizontal position with the arm slung for some time, as if fractured; and, lastly, the wearing of steel stays to support the arm, and keep the scapula *in situ*.

Ganglions.—These are either partial sprains, the fibrous and synovial sheaths being torn, or these sheaths are attenuated and distended with albuminous secretion. A dense tumour situated on a tendon, semi-transparent, and sometimes compressible, and varying in size from a pea to an egg, characterizes them. They are generally formed on the back of the wrist, or upper aspect of the foot, and are oftener a disfiguration than an impediment. The treatment is to puncture with a couching needle or iris knife, and carry this across, in two or more points, through the cyst, but not the skin; then to withdraw the instrument, squeeze the albuminous contents into the contiguous cellular tissue, and apply a compress with bandage. Where the cysts are laid open, violent inflammation follows; and continuing along the sheath of the tendon, becomes extensive, and often serious. Hence they should never be excised. Other modes of treatment have been recommended, but these it were superfluous to mention.

Malformation of Joints.—The shoulder-joint is sometimes so malformed, that the arm and hand are in a state of permanent pronation or supination, and were it not for other malformations, one would suppose the joint had been luxated at

birth. I have not been able to get a *post mortem* examination of this malformation. The treatment consists in applying pasteboard splints.

The whole arm is occasionally so shrivelled as to resemble the fin of a fish. A superfluity of digits is no uncommon malformation, particularly two thumbs; in this case the outer pollex should be removed by amputation.

The hip-joint is sometimes deficient in its acetabulum, the head of the os femoris resting on the dorsum of the os ilium, nearer its crista than in the normal state. This is an imperfect formation of the os innominatum from some obstacle to the evolution of the bones, and no original luxation of the joint. The children born with this malformation have been in good health, but there is a marked disproportional breadth of the hips, with projection of the trochanters, and obliquity of the thigh-bones. As the child advances and begins to walk, the deformity increases; and still more so, when the pelvis begins to enlarge, and the child undergoes longer and more fatiguing exercise. Then the balancing of the trunk on the pelvis, its anterior inclination, a projecting of the belly, apparent shortening of stature, circular movements of the transverse diameter of the pelvis, want of fixity of the heads of the ossa femorum, alternate movements of elevation and descent of the head of the thigh bone along the dorsum of the os ilium, all begin to be manifest.

When the sexual characters begin to develope themselves, the increase of the pelvis, more rapid and conspicuous in the girl than in the boy, renders in her the effects of this malformation much more apparent. Young females, from the play of the heads of the ossa femorum, become almost incapable of any great exertion, the heads ascending nearly to the cristæ of the ossa ilium; in those who are corpulent, pregnant, or dropsical, it amounts to an impossibility. The only palliative remedy is a broad belt round the pelvis, with iron supports down to the feet.

Club Foot—Is a very common malformation, and is either

inwards, outwards, or backwards. In that inwards, the foot rests on the outer or fibular side, with the toes pointing across to the other foot, which is too often similarly formed. This is named *varus*. When the foot is everted, a more rare malformation, it is termed *valgus*. When backwards, the sole of the foot points in this direction, and the individual walks on its patellar or upper surface.

These deformities consist in the luxation of some of the tarsal bones, and the consecutive derangement of their ligaments and muscles. In many, where the foot rests upon, spurious bursæ are formed after birth.

As the child advances, the foot becomes smaller, the muscles of the leg are atrophied; which latter condition is sometimes confined to the diameter, and at others to the length of the limb; the latter being the more serious.

In all of these, if taken immediately after birth, the deformity may not only be rendered less hideous, but by proper apparatus completely removed. The object to be kept in view, is to turn the foot slowly outwards or inwards, and to make such addition to the thickness of the sole of the shoe or boot as to bring the limb into play, that the patient may use the deformed as much as the normal foot. The division of the tendo Achillis greatly facilitates the cure; this is done by inserting between it and the skin, an iris knife, or straight couching needle on one margin of the tendon, until it has passed across to the other margin, but not through the integuments; then cautiously dividing the tendon towards the mesial aspect of the leg, which must be held firmly extended during the operation. The foot is next, with apparatus, to be extended and placed in proper position. This tendon requires to be divided in cases of rigidity of itself, and the gastrocnemius and soleus muscles, producing extension of the foot and partial lameness. After its division, the foot is to be kept bent, and the knee extended, by putting round the thigh, close above the knee-joint, a leather belt, with a strap from it to the toe of a slipper. The individual must afterwards wear, for some time, a steel rod jointed near its connexion with the shoe, and a strap across the instep.

Crooked toe is a frequent malformation, and may be cured in a way similar to club foot, as practised by that able surgeon Mr Liston. He inserts a needle, and divides the flexor tendon or tendons, just as the tendo Achillis.

Contracted palmar fascia arises from inflammation and suppuration, or is peculiar to advanced life. In the former it may be remedied by division, keeping in view the blood-vessels and nerves of the hand. The threads stretching along the fingers are often contracted from scalds or burns, and ought to be divided; the fingers or hand kept stretched on a piece of pasteboard or wood. Unless the division of these threads be had recourse to soon after contraction has taken place, it will be of no avail, as the joints of the fingers become altered in structure. When this contraction occurs in old age, it is irremediable.

The tendo Achillis is often ruptured in sudden and violent exertions, as dancing. The patient is instantly lamed, and the nature of the injury readily distinguished. The knee is to be flexed, and the ankle-joint extended to relax the gastrocnemius and soleus muscles, and kept in this position by a leather belt round the thigh, close to the knee, with a strap from the belt to the heel of a slipper; the patient to remain in bed and sofa for some time, when re-union will have taken place, precisely as in the osseous tissue.

The patellar ligament, I have already mentioned at page 178, ruptures from similar exertions, and is treated like the patella itself, and cured.

The biceps of the arm has been torn across, which is immediately apparent, and is to be treated like fracture of the os brachii, described in page 145. Other muscles have been lacerated in violent exertions.

The sterno-mastoid muscle becomes sometimes so contracted and rigid, as to drag the head to the one side; it requires division. Before doing this, however, let the operator carefully examine the antagonist sterno-mastoid, and see that it has not become feeble or even paralytic; and let him decide whether the muscle be not affected from bad habit, or derangement of the chylopoietic viscera. If satisfied that divi-

sion is indispensable, this should be done at the attachment to the clavicle and sternum, keeping the knife close upon these bones, to avoid wounding the anterior external jugular and subclavian veins. In many, only one of these attachments requires division. The head is afterwards to be kept some time in a natural position by the chin-stay.

CHAPTER V.

WOUNDS.

Wounds are classed into incised, lacerated, contused, punctured, and gunshot. But gunshot are nothing more than contused wounds. They have been long proved to have no poisonous character, as supposed by the ancients, and no peculiarity, as imagined by even some of the moderns. The lacerated and contused are often combined.

Incised Wounds—Are such as are inflicted in surgical operations by the bistoury or amputating knife, and in broils, by a table knife or dragoon's sabre. Such wounds should cease to bleed before their lips be approximated, because the blood acts as a foreign body. If there be any vessels requiring a ligature, these must be secured, and the ends of the threads cut off; these also act as an impediment. We now leave such wounds, even that consequent on amputation of the thigh, open for some hours, commonly eight, with merely a large piece of lint wet in warm water and oiled silk over them. By this time slight inflammation has taken place, the smaller arteries have shrunk and ceased to bleed, and any larger ones, if continuing to bleed, should have ligatures put round them; the loose coagula of blood are easily removed, and the flaps or sides of the wound are now in the most favourable condition for union or the adhesive action. These are then to be neatly approximated, and stitched first in the centre with the needle represented in Plate III. fig. 11,

armed with a single linen threaded ligature well waxed, which is to be tied with the sailor's reef knot, represented in Plate IV., fig. 2. Another stitch is to be taken about an inch to the one side of this, and a third on the opposite side, and so alternately until the wound be closed. Warm water dressing and oiled silk are next applied, and changed once in the twenty-four hours; but the oiled silk should be raised, and water poured on the lint every four hours. When suppuration is established, the lint may require to be changed every twelve hours, for the quantity of pus must now regulate the dressings; and the wound should now be daily syringed with warm water. If the wound look sluggish, the zinc lotion should be substituted, and a bandage applied to prevent the matter burrowing and forming sinuses, which, occurring, must be treated as recommended at page 49.

Lacerated Wounds—Are those rudely incised or torn; they are well exemplified in inflictions by machinery, and are naturally more serious than the immediately foregoing. However extensively torn, or apparently destroyed, the integuments and muscles may be, still an attempt should be made to preserve them, as nature often restores their vitality; one or more stitches are therefore to be employed to keep the lacerated flap in apposition, the wound to be assiduously fomented, the part kept motionless, the patient in bed, on low or moderate diet, with easy bowels. Suppuration always follows, hence abscesses and sinuses are to be expected, and treated as directed in pages 47, 48, 49.

Contused Wounds—Rarely occur without laceration; when they do, they are produced by a direct blow of machinery, or a spent cannon ball. The integuments present a purple ecchymosed appearance. To be treated with fomentations, and the other means recommended for lacerated wounds. Lacerated and contused wounds, or a combination of them, are exemplified in those made by heavy machinery, by the falling of the wall of a house, or by cannon-shot. A lacerated wound can scarcely take place without contusion, and a contused seldom exists without laceration; so that their

combination, and not their disjunction, is to be looked for. Their treatment has already been described, with the exception of poultices, which are preferable when the wound is deep and suppuration profuse. Whenever suppuration begins, the diet must be rendered more and more nutritious, or even stimulant. It is quite extraordinary to observe the quantity of stimulus a patient can bear in such circumstances, without being excited. Wine is the lightest, porter the most nutritious, and spirits the most stimulating beverage.

Punctured Wounds.—These have been investigated at page 71. When from a more formidable instrument than any there mentioned, as a bayonet, a pike, or iron rail, the symptoms may be more manifest, but still they demand treatment upon the same principle.

GUNSHOT WOUNDS,

In my opinion, differ in no degree from those just described, except in the contusion which the rapid projectile causes. Thus, what difference is there between the contusion of a spent cannon ball, and that of a large round stone falling from a considerable height? what difference between the wound made by a musket bullet, and a similarly shaped stone from a sling, or between the wound inflicted by a gun charged with air, or that with powder? Upon this subject, therefore, I would advise the student to dispel from his mind all mystery or exclusiveness.

When, for example, a musket bullet passes through the calf of the leg, or any part of the body, there are two wounds with a long sinuous tube; an entrance and an exit: that made by the entrance of the bullet is depressed or indurated, of a livid colour, much smaller and rounder, and sometimes scarcely perceptible; while that by its exit is larger, more rugged and lacerated, with everted edges. These differences, although occurring in the majority of cases, are not always found; thus the exit is occasionally a mere slit. The appearances seem to depend upon the velocity of the projectile and the density of

of the resisting body. They direct us to decide whether one or two bullets have entered the body, and regulate our treatment regarding search and extraction. The position of the person when wounded, is another guide. Bullets, from resistance, are commonly flattened and rugged. The other day, however, I extracted one indented in the fibula of a Christino; it was as round as when put into the muzzle of the musket.

There is always some bleeding in gunshot wounds, but its extent depends on the condition of the wounded vessels and bruised parts. The hemorrhage is most frequently primary. The treatment of this has been detailed in pages 123, 124. On such occasions it is necessary to put the ligature on the wounded artery, so as to avoid its contused tunics. The pain, in the case specified, is inconsiderable; but in many there is a most acute pain, depending on the laceration of the nervous tissue, and the absence of chemosis.

The sinuous tube for the most part inflames and suppurates, and so do the two wounds: it is a very rare occurrence for the wounds to heal by the adhesive inflammation. Hence, whatever may be our notion of the effect of heat in inflammation or wounds, fomentations and poultices ought to be applied, the limb placed on an elevated pillow, the individual confined to bed, his diet low, and bowels open.

The wound then commonly heals by granulation, requiring warm water dressing, zinc lotion, and very gentle bandaging. These wounds bear but slight bandaging, the least pressure excites inflammation.

If any pieces of the clothes have been retained, let them be extracted; but no torturing search should be made in the recent wound, as they can be removed when suppuration takes place. Uncalled for dilatation is now abandoned.

If there is only one wound, we are to expect that the bullet has been arrested, and if at all practicable, it should be immediately extracted, because it generally excites irritation immediately after the wound has closed, or at some distant period. We are not to wait for its forming a fibrous cyst, and remaining dormant.

The attitude of the individual when wounded, often guides us, and the finger is commonly our best probe. When the

bullet is not extracted on receiving the wound, it either burrows from the motions of the body, or becomes encysted; in the former instance, frequently exciting greater irritation, and involving more important organs; in the latter, still keeping up irritation, as in a bone exciting necrosis or caries, or in rare cases, remaining dormant, as in the brain. In general, the bullets are much flattened, rugged, and surrounded by a fibrous cyst, and in removing them, a free crucial incision is required. Bullets occasionally take a very circuitous route in body; for example, they have entered at one arm, run round the posterior aspect of the thorax between the skin and ribs, and lodged in the opposite arm. A bullet has passed between the superficial femoral artery and vein, the carotid and internal jugular, without producing primary hemorrhage. When a bullet strikes the one end of a bone, it often splits it the whole length.

A bullet striking an important joint, as the knee, produces violent constitutional irritation, and occasionally immediate death, as in the case of the Duke of Montebello, related by Larrey.

Wounds by Cannon-shot.—The shot consist of large, round, double-headed or bar shot, grape, cannister, langrele, langrage, and shells. The constitutional irritation, however, more frequently follows cannon-shot, and is evinced by a pallid anxious countenance, cold clammy skin, feeble pulse, and acute pain. It has become a question, since the memorable cannonading of Algiers, whether such symptoms always exist, also at what time they supervene. From the record of the wounded at Algiers, it appears that the greater number were brought to the surgeons before these symptoms developed themselves; for, says Dr Quarrier, "in no instance could we perceive the dreadful perturbation and constitutional shock so frequently described, until some time after the injury had been received." The time of supervention seems to depend on the severity of the wound; and even Dr Dewar says, "From the issue of the cases, it is evident that no great danger is to be apprehended from delaying amputation for a short time, (no urgent symptom in the meantime occurring to require

it,) provided it is performed before symptoms of inflammation or of general re-action have come on." From all the facts, therefore, it is evident that cannon-shot may produce these constitutional symptoms at once, by striking for example the knee-joint, may induce them at a more distant period by carrying away the arm above the elbow-joint, and at a still more remote period by hitting the thigh. These last, however, must depend on the extent of nervous lesion. In general, the wounded gradually recover from this depressed state, the skin becomes warm, the pulse fuller and softer, the countenance more lively, and some degree of thirst is excited. These symptoms are soon followed by violent inflammatory fever, and acute inflammation of the wound, which in no short time commonly put an end to the sufferer. If not, profuse suppuration, sloughing of the parts, exfoliation of bones, lingering hectic fever, cause the fatal termination.

From this view, there are three periods at which amputation may be performed:—*First*, instantaneously after the wound, before nervous perturbation has taken place; *secondly*, immediately after this shock has disappeared, and slight re-action come on; *thirdly*, during the suppurative stage.

The two first are particularly important, and require careful investigation. If the wounded limb is so shattered, that there is no prospect of preserving it, and there are no constitutional symptoms present, the sooner so injured a member is taken off the better, and the more likely is the patient to be preserved from the constitutional irritation which must follow. This, then, may be termed "Instantaneous Amputation," an opportunity, says Hennen, seldom enjoyed by the army surgeon. —Here the reader is requested to compare what has been said on fractures and luxations, and to remember there is more contusion of parts in these wounds.

If the wounded person, with such an injured limb, is labouring under the constitutional symptoms, we must wait until they be on the decline, and until warmth of skin, softness and fullness of pulse, cheerfulness of countenance, and thirst, begin to develope themselves, in other words, till a re-action of the powers of life take place, and then amputate. This has been long considered "Primary Amputation." During the stage of

collapse, cordials must be administered, but sparingly, for fear of violent re-action; their necessity is proved by convulsions, hiccup, vomiting, and wavering of intellect supervening.

In peculiar cases, however, as in that of the late Mr Huskisson, when the nervous lesion was evidently keeping up the constitutional depression, amputation should be performed. A girl was brought to the hospital one evening, with her leg from knee to ankle-joint so injured by more than one loaded railway waggon passing over it, that its removal was agreed on, but she was so lifeless, that any operation seemed hazardous. On examining the popliteal space, it resembled a dissection of the nerves for an anatomical demonstration; I therefore strongly urged my colleagues to agree to amputation, and adduced cases in illustration. The operation was performed about 10 o'clock P. M. when there was scarcely a pulse to be felt, but a cold clammy skin, deadly countenance, and vomiting. Only one artery, the superficial femoral, required a ligature. She continued moribund and vomiting until 4 o'clock the next morning, during which small quantities of hot brandy were poured into her mouth from time to time. She is now in robust health. In cases like that of Montebello, who was delirious from the instant of being wounded, no operation dare be performed.

When suppuration has supervened, and amputation is performed, it is named "Secondary Amputation;" this operation is almost always fatal, as was observed in the Russian ships after the battle of Navarino.

Instantaneous or primary, is accordingly to be had recourse to, whenever a limb is considered incapable of preservation.

There is a false courage occasionally assumed by the wounded, from the apprehension of delay, and from the fear of bleeding to death before amputation be performed. Here we must tranquillize the mind.

In cold weather, we must be careful that the wounded be not under its immediate influence. Monsieur Boy, in the memorable campaign on the Rhine in 1793, observed many die from amputation having been performed while their bodies were stiff with cold.

Wind of a Ball.—Though a cannon ball, nay, a musket

bullet, just contuse the skin, so that the injury is hardly perceptible, yet it sometimes produces most alarming, even fatal symptoms. Schmucker's case of a soldier whose queue was shot away, and who laboured under a state of stupor many days, in defiance of the most active antiphlogistic treatment, is an illustration ; and Major King of the Fusileers, who was killed at New Orleans by a musket bullet striking the pit of his stomach like the blow of the pugilist, is another.

Many who are wounded with either musket or cannon shot, have their lungs, liver, stomach, or brain so concussed, as to lead to a fatal termination, as in the instance of General Caferelli, whose arm only was wounded. The way to reconcile to ourselves these distant organs suffering, is, that they are more delicate, sensitive, and vascular, *cæteris paribus*, than the other organs, or that they have been diseased some time previously.

The effect on the brain has been followed by very remarkable states of the memory and language, as related by Larrey, Hennen, and other writers on gun-shot wounds.

Wounds made by pieces of shell.—Shells, grape, langrage, cannister, splinters of wood, inflict generally a rugged lacerated wound, and often lodge, exciting severe irritation, and giving rise to tetanus. Such wounds require most active treatment, and frequently demand amputation.

Tetanus, very often the effect of gunshot wounds, on board of ship from splinters, did not occur after the battle of Algiers, though it raged like an epidemic after that of Toulouse. It supervenes to punctured wounds by needles or nails, to the smallest abrasion of the skin, and to scalds or burns. This malady follows some surgical operations, as extirpation of the testis, of glands in the groin or axilla, amputation, the securing of an artery for aneurism, phlebotomy, and even takes place from exposure to cold. This last is named idiopathic, while that caused by a wound, traumatic. This spasmodic affection has occurred in infants from irritation of the umbilical cord, and is then termed "trismus nascentium." I have seen it in severe cases of cholera.

Tetanus is either acute or chronic ; the former, rapid and

severe, is generally fatal; the latter, very slow, is frequently cured.

It is divided into several species; thus, when it is confined to the muscles of the throat and lower jaw, it is named trismus, or locked jaw; when the body is bent forwards, emprosthotonos; backwards, opisthotonos; and laterally, pleurosthotonos. Besides, when the whole body becomes rigid, and retains its straightness, this is called Tetanus.

This malady seems to consist in a lesion or excitement of the nerves, which rapidly involves the whole nervous system. Dissection shows highly injected neurilematic sheaths of the roots of the spinal nerves, with the vessels of the membranes of the spinal cord and brain loaded with blood, and these appearances according to the duration of the disease, as first pointed out by Dr Sanders, Sen., (see Edinburgh Med. and Surg. Jour. Vol. XV., p. 283.); but when it has proved so rapidly fatal as in the space of a quarter of an hour, we can expect no morbid appearance. It follows an injury either quickly or slowly, commonly from the fourth to the twentieth day. In the late Peninsular war the wounded were considered safe after the 22d day. Larrey observed that those wounded on the anterior part of the body had emprosthotonos, and *pari passu* with the other species. Also that this affection prevailed during sudden alternations of temperature; was most severe in warm climates, much more so in Egypt than in Germany.

Generally the patient complains of increasing pain in the wound, which becomes inflamed, and discharges a gleety matter in small quantity. The pain extends to the neighbouring parts, is increased on pressure, and darts along the nerves. A sensation of stiffness in the neck is felt, rendering the movement of the head painful and difficult, which rigidity soon invades the muscles of the lower jaw and tongue. The sterno-mastoid, masseter, and temporal muscles are hard and rigid. He now feels difficulty in chewing and swallowing, and is unable to open his mouth; and often imagines he has only sore throat from cold. These two last symptoms have begun the series, and deceived both patient and surgeon.

When the patient attempts to swallow, especially liquids, there is a horrid convulsive effort; he soon rejects whatever nourishment is offered him, and thus trismus is formed: the rigidity and stiffness extend down along the back, producing convulsive motions backwards, and thus constituting opisthotonos, for these two are often combined. When he attempts to move, he is violently convulsed, and screams from agony. He feels severe pain at the scrobiculus cordis, darting across the diaphragm to the back, and impeding his respiration, and making him feel as if he were tied down to the bed. The convulsive spasms increase in violence, and put an end to his sufferings.

Some however linger, and then the arms become affected, and he is unable to raise his hand to his head. The muscles of the abdomen are next involved, and lastly those of the legs. The face presents a horrid grin termed spasmus cynicus, and death soon follows.

The pulse is not altered until the disease has been fully developed, at first is smaller, afterwards quick and irregular; the skin, in the latter stage, is covered with profuse sweat; the bowels are obstinately constipated from the beginning; the urine is high-coloured and scanty, and voided with difficulty.

According to the reports of the army in the late war, when several hundred men were affected, they died on the second, third, or fourth day, very few surviving to the eighth. I saw lately a mail coach driver fall a victim to emprosthotonos in 24 hours. He had a small abrasion of the skin on the dorsum of the nose.

The treatment consists in large doses of narcotics, particularly opium and tobacco, administered *per anum;* in keeping the bowels relaxed; and in applying fomentations and poultices to the wound. The diet mild and nourishing. An enema of 10 grains of tobacco boiled in two pounds of water may be administered every twelve hours, the effect of which is to subdue the nervous excitement, produce sleep, and open the bowels. Opium, from constipating, should be avoided as much as possible, still it is often essentially necessary at bed-time. Belladonna promises to be beneficial. Senna and salts are the best purgative. Croton oil in the tobacco injec-

tion will be found cathartic when necessary. The poultice to the wound may be made of a decoction of tobacco, or this and opium combined.

All torturing remedies to the wound, as incisions, caustics, and cauteries, I have seen aggravate the symptoms; all cauteries to the spine do the same. Bleeding does more harm than good; and amputation fails.

The disease, like typhus fever, runs a certain course, and all that we can do, is to palliate,—we cannot arrest its progress. Let the reader consult Larrey and Sir James M'Grigor's able researches.

BURNS OR SCALDS.

Burns, according to the application of the term, are often produced by gun-powder, and may be with propriety considered here; while scald is applied to the lesion produced by boiling water. But the division is totally unnecessary, in my opinion. The injury or wound is the same in its nature, character, and effects; and what we have to attend to, is the depth and extent.

When a large extent of surface is burnt, it proves as severe to the constitution, as when a small portion is burnt to the bone, evidently from the highly sensitive nature of the skin, influencing directly the brain and heart.

A burned part may exhibit merely an efflorescence, or a vesicated appearance, or a dark red tint, or deep black colour. In the efflorescence or blush, the surface of the chorion is but slightly affected; in the second, or vesication, all the textures of the skin are inflamed; in the third, the skin, subcutaneous cellular tissue, and part of the contiguous muscular stratum, are inflamed and chemosed; in the last, all these together with the deep muscular substance, nerves, and blood-vessels, are charred.

The florid blush, or erythema, when properly treated, ends mildly in resolution, but when neglected, it may become erysipelas, or even erysipelas phlegmonodes.

The inflamed surface with vesication, judiciously treated,

ends also in resolution; but if not, in erysipelas or erysipelas phlegmonodes.

The chemosed and inflamed part, however carefully managed, must slough to a certain extent; and the charred part will do so throughout.

In extensive burns, there is great prostration of strength, and if the patient rally, wild delirium or coma; on some occasions there is oppressive difficulty of breathing; on others, violent symptomatic fever. In the advanced stage, inflammation and ulceration of the mucous membrane of the alimentary canal supervenes, and in some instances hydrocephalus. Many have hectic fever, along with the profuse discharge.

The treatment at first should be, swaddling the part in cotton wadding, together with gentle bandaging, so as to exclude the air effectually, and allowing this dressing to remain until saturated with pus.

In te first or mild cases alluded to, this application may remain for ten days or a fortnight, when all irritation will have subsided, and the part be cured. During this process, the patient should be confined to bed, have moderate diet, and have his bowels attended to.

In the second or vesicated cases, it may remain the same time, and the rest of the treatment may be the same. But there may be slight ulceration, requiring poultices or warm water dressing.

In the third, or chemosed and inflamed part, as suppuration is inevitable, eight days at furthest should be allowed to elapse before its removal; and then poultices for a few days, afterwards warm water dressing, zinc or copper lotion, &c., are to be applied, as the surface is now an ulcer. Here the granulations become remarkably flabby, and shoot above the level of the skin, and are with great difficulty repressed by sulphate of copper, nitrate of silver, dry lint and bandage, which, however, are the suitable applications.

Whenever suppuration ensues, the diet must be very liberal, to sustain the fading strength. Sloughs require to be cut away; and great pains must be bestowed to prevent unnatural adhesions, such as one finger to another, the fore-arm to the arm, the chin to the neck, or even to the breast.

When the part or extremity is charred, amputation is often indispensable as soon as the powers of life have rallied.

There are various whimsical modes of treatment for scalds and burns, from that of Dr Kentish to our late worthy townsman, Mr Cleghorn the brewer.

Contraction from Burns.—These often cause sad disfigurations of the countenance, or mutilations of the extremities, and are exceedingly difficult of remedy. The treatment is to divide the band of adhesion, and give relief to the confined part, then to interpose a portion of sound integument, and keep the part in its natural position. Thus, if the chin is bound down to the neck or breast, the contracted cicatrix is to be freely divided, then a portion of sound skin is to be dissected from the vicinity, to correspond with the raw surface, and to be gently twisted at its root or isthmus of connexion, and approximated, by stitches, to the sides of the integuments, bounding the raw surface. The sound integuments thus interposed between the chin and the neck, will prevent all risk of recontraction. If there is no sound integument in the vicinity, the division of the cicatrix seldom affords relief.

CHAPTER VI.

AMPUTATION.

I HAVE already considered most of the diseases and injuries suited to this operation, for, properly speaking, there is but one or two tumours, as the medullary sarcomatous, not yet described, which, when involving the circle or joint of a limb, may demand it. It may be therefore set down, that amputation should be performed when a member of the body is so injured, or diseased, or useless, as to endanger the life, or be of no service to the individual; a point of decision often perplexing to the surgeon, especially on board of ship, or in the field of battle. In the case of the useless limb, for example, in disunited fracture of tibia and fibula, these bones being fractured at birth, and the patient twelve years of age, the nature and danger of the operation should be explained to the parents. A case of this nature came under my care lately, where I amputated, and the boy is now active and useful. When the individual is older, and able to judge for himself, the operation should be proposed by him, or the operator ought only to hint at it.

When a patient travels any distance to undergo this or any other operation, he should be allowed to rest for two or three days, otherwise the amputation will induce smart fever, and probably a fatal termination; if not, the stump may inflame, suppurate, and slough, attended with primary or secondary

hemorrhage. During these few days he should be dieted, and on the day preceding have a gentle purge.

Amputation of the Thigh.—The instruments and every thing being arranged, the patient should be placed on a low firm table, his limbs well over its edge, the sound one confined to its leg by a towel round the ankle, and the diseased one firmly supported by an assistant on a low seat; another assistant then compresses the trunk of the femoral artery above the profunda, as represented in Plate XVII. fig. 1. The operator, standing on the left side of the patient, now firmly grasps the inner side of the thigh, pulls the mass towards him, and plunges the knife marked *d* perpendicularly between this flap and the tibial aspect of the bone, pushing it slowly down to the popliteal aspect; he next cuts by the side of the bone three or four inches, according to the muscularity of the limb, and brings the knife towards himself, dividing muscles and skin, so as to form a semicircular flap. An assistant should then put his fingers on the superficial femoral artery and vein of this flap, but not pull it; while the operator grasps the outer side of the thigh, pulls the parts from the bone, reinserts the knife at the cut angle, but between the bone, on its fibular aspect, and the outer flap, plunges it slowly down to the popliteal aspect, to the lower cut angle, and carries it along the bone to the same extent as the first incision, and then cuts outwards; the muscles and skin are to form an outer semicircular flap corresponding with the inner. Both flaps are now retracted by the assistant, the bone cleaned of any muscular tissue, and sawn, as delineated in Plate XVII. fig. 2. The arteries on the stump, as depicted in Plate XVII. fig. 3., are to be immediately secured, with the forceps, marked in Plate III. fig. 13., tying first the superficial femoral, marked *a*; secondly, the long perforating branch *b*; thirdly, any others *d*, *d*, *d*, *d*, bleeding freely. Much time need not be devoted to the securing of the arteries on the operating table, since, in the collapsed condition of the patient from fear, pain, and cold, many arteries do not bleed until re-action take place, or too much stimulus have been given. All that the operator should do, is to secure the ves-

sels mentioned. During this operation there is often venous hemorrhage, until the blood from the stump distend the valves of the veins; hence the finger of the assistant must be kept on the trunk. If a nerve is near the margin of a flap, it should be shortened to prevent neuroma supervening. The bone should next be examined, and if there be any spicular projection, that should be nipped off with the pliers. The periosteum ought to be carefully watched by an assistant during the operation, as it is liable to be retracted, and lay the foundation for exfoliation of the bone hereafter, particularly in young subjects, who have laboured some time under diseased knee-joint. If such happen, I would advise that portion of bone, divested of its membrane, to be sawn off, before removing the patient from the table. The flaps are now to be approximated, and a large piece of lint dipped in warm water applied over them. The sound limb to be unbound, and the patient carried to bed, then the stump is to be elevated on pillows, with a cradle over it, and a dresser stationed to watch any bleeding, and to wet the lint from time to time, but not to disturb it.

If hemorrhage occur within eight hours after the operation, it is from small arteries, which are to be instantly tied. This is easily done, and without much pain; the flaps are separated, any coagulated blood wiped away, and the bleeding vessel taken up. Here a tenaculum, marked Plate III., fig. 12., is often the best instrument.

At the end of eight hours, let the flaps be approximated, and treated as described in page 190. When a bandage becomes necessary, great art is required in moulding the face of the stump. At first the bandage should be applied very gently, and always from the loins downwards; and when near the surface of the stump, one or more turns should be carried across the line of union, so as to give due support to the flaps, carefully avoiding the bone. No adhesive plaster or Malta crosses should be applied.

If hemorrhage supervene, after re-action has continued a few hours, it must be from the long perforans of the profunda, or the superficial femoral itself; and the question here is, whether to treat it as recommended above, or cut down in the

thigh for the femoral trunk. Did the bleeding take place within thirty or forty hours, the former may be adopted, but after this time, the trunk should be secured as directed in page 103.

Secondary hemorrhage is rare in this amputation, because of the length of the superficial femoral artery from the profunda, for it is the trunk, and not the branches of an artery, which bleed secondarily.

I may now discuss the other modes of performing amputation; and first, the compressing of the arterial trunk. The tourniquet, depicted in Plate III., fig. 3., is now only used by operators of the old school, or those of the modern ignorant of anatomy. Its mode of application is as follows:— A calico bandage, about two inches in diameter, is first placed along the femoral trunk, not the superficial, as I have often seen, and here secured by one or two turns of the same round the thigh. The tourniquet is next to be put on this bandage, the screw over the artery, and the buckle on the outside of the thigh, and never the reverse, as is often done. The strap should be firmly buckled, but not tightened by the screw, until the operator be prepared to make his first incision. After the limb has been removed, if the operator find any difficulty in discerning the smaller arteries, the assistant having charge of the tourniquet should unscrew it rapidly, not slowly, as is commonly done, to enable the vessels to throw their blood out freely, and thus be perceptible.

The circular incision is now also abandoned, and if applicable any where, it is to that of the arm between elbow and shoulder-joints; the first incision should sweep down to the bone, as done in the time of Celsus, and revived by Dupuytren, and not layer after layer of skin, superficial and deep muscles, as recommended by Allanson and Hey.

The flap operation, as just described, was first invented by Vermale; but he made anterior and posterior flaps, particularly in the upper half of the thigh, a mode advocated by some of our best modern surgeons. I have, however, seen the bone protrude through the anterior flap.

Lateral flaps are more quickly made by incising from without inwards, than by transfixing, because thus their plumpness

and roundness can be better calculated. The inner flap is to be grasped in the same way, and with a knife a little longer, a semi-circular incision is made through the integuments and muscles, obliquely upwards to the bone, and then along the latter the requisite length. The outer flap is next made, beginning opposite the incised surface on the thigh. The flaps are retracted, and if seen to be too short, can be easily lengthened by extending the incision along the bone. Here there is no reversing the form of incising, as in transfixing, for the arteries are cut more completely across, and the flaps can be calculated to mathematical precision.

Retractors, of either calico, leather, or iron, are now laid aside, the hands of an assistant being the best.

The arteries of a stump are secured by dissecting forceps, marked fig. 13., or artery forceps, fig. 6., or a tenaculum, fig. 12., or a curved needle, fig. 5., of Plate III. The dissecting or common forceps are best adapted when the contiguous cellular and muscular tissues are healthy ; the artery forceps, which are pointed with small teeth, and have a spring that locks, when there is no assistant at hand ; the tenaculum, when the muscular tissue is firm ; and the curved needle of Petit, when the cellular tissues are condensed by disease.

Torsion of bleeding arteries is advocated by many, especially French surgeons, but my own experience is against its safety ; it is more applicable to the larger than to the smaller series of arteries ; it will succeed more frequently with the superficial femoral, than with the perforating branches of the profunda. Therefore, if ligatures are required to these smaller vessels, there is little gained by torting the trunk. It is performed by two pairs of artery forceps, having checks somewhat similar to that in Plate III., fig. 6. With the one pair of forceps, the bleeding vessel is pulled out of its bed about a quarter of an inch, and with the other grasped at this point, and the intermediate portion twisted round or torted two turns or so, with the first pair of forceps. This, it will be perceived, lacerates the two inner tunics, similar to what nature does in stemming hemorrhage when a limb is torn by machinery, see page 124., or what results in tying an artery with a ligature, see page 97.

After amputation, there are other occurrences than hemorrhage, abscess, or sinus; these are spasms, tetanus, protrusion of bone, exfoliation, necrosis, phlebitis, purulent deposit, conical stump, retention of ligatures, and neuromatous tumours.

Spasms rarely run onwards to tetanus, they are commonly of the duration of a day or so, and are subdued by opiates, and confining the stump with a broad bandage stitched to the mattress.

Protrusion of bone ought never to supervene to a well formed stump, unless one or both flaps slough. Exfoliation follows, divesting the bone of its periosteum during the operation, or when this membrane has been bruised, or when an abscess or sinus continues long near. Necrosis results from all of these, and may extend upwards to the head of the bone. In any of these instances, the bone ought not to be early removed.

When the bone protrudes, the stump should be allowed time to consolidate, and then an incision is to be made on that side of the stump free from the vessels along the bone, which is to be divested of its soft attachments, and enough sawn off to form a bulbous stump. A conical stump is almost the same, for here there is just enough of skin to cover the end of the bone; this requires the same proceeding, and never a secondary amputation. In a well-formed stump, the bone secretes very little callus at its extremity to afford a resting point to the limb, and hence the necessity of muscular substance. This occasionally becomes cartilaginous in front of the bone. In badly-formed stumps it is absorbed, and then nothing but integument covers the bone. However, artificial legs, both cork and wood, are now so admirably fitted, that there is no pressure on the end of the bone. Exfoliation and necrosis are to be treated as recommended in page 131.

Phlebitis is seldom a sequence of amputation, unless the veins be fretted with sponges, forceps, and tenaculum, included in the arterial ligature, or secured instead of an artery, which last is no uncommon practice. The treatment of this affection is detailed in page 39.

In the full vigour of life, purulent deposits in the lungs, liver, and joints, occasionally take place in those who suffer amputation for severe injuries, and they are sometimes preceded

by phlebitis, see page 39. In some rare instances the cervical vertebral articulations are the seat of such.

Retention of ligatures can only become a source of uneasiness to the operator who leaves them protruding from the wound. I have never found them, when cut close to the knot, either retained beyond three months, or ever produce abscess and irritation, see page 97; I have seen, however, long ligatures cause abscesses, sinuses, protracted union of the flaps, and fatal termination.

Neuromatous tumours are formed on the extremities of the divided nerves, when not sufficiently covered by the soft tissues; but all nerves thus cut, produce elegant ganglionic swellings, free from pain, from which nervous filaments proceed to the contiguous tissues; these tumours varying in size from a common bean to a walnut, are remarkably sensitive, and acutely painful. When bisected, they closely resemble a healthy ganglion, though, being intersected with fibrous tissue, they are much more indurated. These tubercles must be carefully dissected and excised together with a portion of the healthy nerve; amputation invariably fails, and more especially if the nerves in the secondary operation be left in relation to the muscular and cutaneous structures, as they were in the first amputation. See Med. Chir. Review, for 1828, page 435. It is the too thin covering of the nerves, exposing them to the vicissitudes of temperature, that seemingly produces these tumours.

In connection with neuromatic affections we may mention a disease of the nerves, termed neuralgia, for which amputation has been performed. Mr Tyrrell, of St Bartholomew's Hospital, amputated a fore-arm for this disease in the fingers; the malady returned, and Mr Langstaff amputated at the elbow-joint; it still recurred, and Mr B. Cooper removed the arm at the shoulder-joint, and obtained a cure. Mr Mayo, of the Middlesex Hospital, removed a limb for this disease, in the nerves of the knee-joint, but the nervousness recurring, he amputated at the hip-joint with success. On examining the first stump, neuromatous tumours were discovered on the great sciatic and saphenous nerves.

Amputation in upper third of Thigh.—Except at the hip-joint, amputation should be performed with two lateral flaps, throughout the thigh. In the upper, the lateral are more applicable than in the lower third, because the psoas and iliacus muscles bend the hip-joint, and keep the stump almost perpendicular. For the same reason, sinuses are more liable to supervene. This operation is frequently fatal.

Amputation at Hip-Joint.—Let the patient be placed on a low table, the nates projecting over the edge, and the sound limb secured to its leg. An assistant is next to compress with one thumb the external ilial artery as it emerges from the pelvis, as depicted in Plate XVIII. fig. 1; then the operator with his left hand rotates the thigh inwards or tibiad, and enters the knife close above or atlantad to the trochanter major, and carries it across the thigh, closely anterior or patellad to the head of the os femoris, and out near the scrotum, which with the penis must be kept aside by an assistant. The knife thus across is to cut slowly downwards or distad, to enable the assistant to insert his four fingers into the wound at its back, as represented in fig. 1., and by this means, grasp the part to be made the flap, and compress more effectively the arteries. The assistant having perfect controul over any hemorrhage, by his one hand grasping the anterior flap, while his other compresses the arterial trunk, the operator now completes this flap, which should be always considerably larger than the posterior.

The assistant holding up this flap, the surgeon divides the fibrous capsule of the joint, (part of which may have been cut in transfixing,) and its round ligament, when, if the gluteus medius fibres have been divided in making the flap, the limb falls down; but if not, it must be depressed with some force, and the knife carried round both trochanters to the back or popliteal aspect of the bone, as delineated in Plate XVIII. fig. 2; and swept obliquely downwards or poplitead through muscles and integuments, making this much shorter than the other flap. The limb being removed, a large warm sponge is to be applied to this inferior surface, and kept firm by an assistant, or he may put his fingers on each artery and compress it; in doing this, the number of bleeding points should

regulate him. The operator first secures the superficial femoral artery, marked *d*, in Plate XVIII. fig. 2, for the flap extends down to this vessel; secondly, the branches of the profunda, marked *f, f, f, f*; thirdly, the obturator, *g*; lastly, the arteries of the lower or sacral surface, as the sciatic, and the gluteal.

The arteries secured, the anterior flap is to be laid downwards, the posterior upwards, a large piece of lint wet in tepid water applied, and the patient carried to bed. The after treatment is the same with that recommended for the thigh, in page 205.

In the first transfixing, the point of the knife often hits the head of the thigh-bone, so that the operator must proceed slowly here, and he will open the joint at the same time. If he can rotate the thigh inwards, and divide many of the fibres of the gluteus medius, when the anterior flap is made, he can insert the knife with facility behind the trochanters, and complete the operation much more dextrously.

The preceding mode is Brownrigg's, and superior to all others. Lisfranc transfixes from above downwards, or from the patellar to the popliteal aspect, and makes the outer or iliac before the inner or pubic flap. Larrey makes the inner flap first, and (in his first operation) secured the inguinal artery before transfixing, in which latter step he has been followed by Sir A. Cooper and others. Abernethy, and several surgeons, performed in the first instance the circular amputation of the thigh close to the hip-joint, and then excised the head of the os femoris; which mode of procedure is the safest in the debilitated. This operation was made the subject of a prize essay twice by the Royal Academy in France, first in 1756, and next in 1759; at the first proposal, no papers were written, but at the second, thirty-four were given in, and 20 were in its favour; but it was first performed by Thomson in the London Hospital. It has been practised successfully.

Amputation at the Knee-Joint is advocated by Velpeau, but, in my humble opinion, inconsiderately. The skin is divided in a circular form three or four fingers' breadth, beneath or distad to patella, and is reflected backwards with the

adherent cellular and adipose tissues, and then retracted by an assistant; the operator divides the patellar and lateral ligaments, separates the extremities of the bones by bending the knee, detaches the semilunar cartilages, cuts across the crucial ligaments, and finishes by dividing the vessels and nerves on a level with the reverted integuments. After the arteries have been torted or secured with ligatures, the integuments are approximated so as to form an angle above and below.

Amputation of the Leg.—This, in my estimation, should always be done immediately below the knee, distad to the tubercle of the tibia, whatever may be the rank of the patient. The individual should be placed and secured just as in that for the thigh, see page 204. The operator then may either transfix or cut from without inwards, as represented in fig. 3. of Plate XVI. Let us suppose the latter mode. Compression being made on the superficial femoral artery, the operator, standing on the left side of the patient, grasps the calf of the leg with his left hand, and sweeps with the knife obliquely upwards to the bones, along which it should glide to the point marked to be sawn. The knife is next to divide the integuments and muscles on the anterior or patellar aspect, extending between the extremes of this flap, and also the interosseous ligament, and any remaining muscular substance, which last may be done by cutting distad or downwards. This anterior portion of skin and muscular substance, together with the posterior flap, are to be gently retracted by the fingers of the assistant, while the bones are sawn. The posterior tibial artery marked *a* in fig. 5. of Plate XVI., is first secured, next the anterior tibial *b*, and any muscular branches, as the gastrocnemial, *c*, *c*. The wound is generally proximal or above the fibular artery; but frequently, just where the popliteal divides into the anterior and posterior tibial branches, making a peculiar oblique mouth of the anterior, which is exceedingly difficult to surround with a ligature, and which I have seen require a tenaculum to be left in the wound, the handle having been cut off with the pliers. To obviate such perplexity, the artery must be dissected down to its origin the popliteal, and this trunk must have the ligature thrown round it; the ligature on the

posterior tibial artery, therefore, should be gently pulled, to enable the operator to accomplish this.

Exarticulation of Head of Fibula.—Larrey recommends the head of the fibula to be excised or exarticulated when amputation is so near the knee-joint; but this, in my opinion, ought never to be done, since in so doing, the synovial membrane of this articulation is wounded, and in nine cases out of ten, acute inflammation and suppuration induced. The preliminary incisions are the same, and after the tibia has been sawn, the fibula is employed as a lever, and its head excised with a bistoury.

Amputation of the leg nearer the ankle-joint is executed in the same way as that just described, but it is objectionable from the small cushion of muscular substance, and the tendinous nature of that cushion.

Amputation of the Foot.—The foot may be amputated either between the astragalus and os calcis on the one side, and the os naviculare and cuboides on the other side, as recommended by Chopart, and depicted in fig. 2. of Plate XVI.; or between the tarsal and metatarsal bones, as proposed by Hey, and represented in fig. 3. of Plate XV. The latter has been proved to form a useful stump, but the former one so useless, that, according to Larrey's experience, a second amputation is required above the ankle-joint.

Compression is made by an assistant grasping the ankle with his left hand, the fingers of which are on the course of the posterior tibial artery, while the thumb of his right hand rests on the anterior tibial vessel.

Hey's amputation is most easily accomplished by cutting from without inwards; the operator grasps with his left hand the fleshy and tegumental substance of the sole of the foot, as seen in fig. 3. of Plate XV., and with a strong bistoury begins his incision at the projecting head or proximal extremity of the metatarsal bone of the little toe, and carries it around close to the toes, to the base of the metatarsal bone of the great toe; this mass he dissects close to the metatarsal bones backwards to their tarsal ends, so as to form as thick a flap as possible;

he then makes a transverse incision of the skin on the patellar aspect of the foot, so as to connect the extremes of this flap. He should now grasp the toes, depress them with moderate force, and divide the ligaments connecting the metatarsal with the tarsal bones, commencing at the little, and ending at the great toe, keeping in mind the strong intertransverse ligaments. Hey imprudently sawed across the projecting portion of the internal cuneiform bone, thus detaching the tibialis anticus, the only flexor muscle left. The future steps are precisely the same as those for the thigh, in page 204.

Chopart's operation, represented in fig. 2. of Plate XVI. is much more easy. The flap here may be made either by transfixing, or as is done in Hey's. The joints are more speedily found, and dislocated.

Amputation of the Toes.—In destruction of the toes, either from injury or disease, we often remove one or two of them; the great toe, from its situation and functions, is the most frequent. In this operation, depicted in figs. 1. and 2. of Plate XV. an incision is made with a strong bistoury through the integuments along the metatarsal bone to the first phalanx, round which it is continued, and deepened so as to insulate this end of the bone; a lever is thus formed, by which the knife can be carried close to the bone backwards to its metatarsal base, which is then to be dislocated with the bistoury or the pliers. If the operator keeps the knife close to the metatarsal bone, he will avoid the anterior tibial trunk. An assistant must be at hand to compress, if required, as recommended in Hey's operation. The other vessels wounded in this amputation are generally so small, that it is impracticable to put ligatures on each of them; the wound, therefore, must be gently stuffed with teased lint, a stitch or two inserted in the sides, and a bandage lightly applied over all.

The smaller toes are amputated precisely in the same way as the fingers.

Amputation of the Fingers.—In Plate XI. the manner of amputating these is satisfactorily displayed. Figs. 1. and 2. exemplify the removal of the third or distal phalanx; the

hand being fixed by an assistant, who keeps the other fingers from being injured. The tip of the diseased finger is seized hold of by the left hand of the operator, and the narrow bistoury swept across the anconal aspect or back of the joint, which is thus opened, and the knife slowly passed between the bones, and lastly, behind the phalanx to be removed, making a long semilunar flap of the integuments on the palmar aspect. These joints must be slowly opened, and the bistoury passed slowly between the bones, otherwise the projections of the bones impede the operator. The arteries do not commonly require ligatures. The after treatment is described in page 205.

Figs. 3. and 4. illustrate the removal of the two distal phalanges, and the fore-finger of the right hand has been selected, as the preservation of the first phalanx is important, which hitherto has been recommended to be amputated whenever these two require this operation. I have tried it in several mechanics, as carpenters, and found their hands become nearly as useful as ever. The mode of amputating at this articulation is precisely the same with that last described.

When we remove the whole finger, as delineated in figs. 5. and 6. we grasp the finger, make a perpendicular incision of a semicircular shape on one side of the joint, which we open with the point of the narrow bistoury, and conduct the instrument round the base of the phalanx, and cut outwards, making this flap to correspond with the first. After the finger has been removed, the two digital arteries may require to be secured; but they usually cease to bleed after the contiguous fingers have been tied together, and the hand raised. A piece of wet lint is to be applied, as already recommended. No stitches are required for this wound. Some very improperly recommend the cutting off the cartilaginous head of the metacarpal bone with the pliers, forgetting the strong ligamentous junction between the heads of these bones, which forms the chief strength of the hand.

A carious metacarpal bone may require excision, which is done by incising the integuments on the back, or anconal aspect over the bone, detaching its head from the first phalanx, then raising it, and divesting it of its muscular at-

tachments, and severing its carpal connexion with the pliers. It is almost impossible to disarticulate with a bistoury the metacarpal bone of the fore-finger from the trapezoid bone. In the removal of a metacarpal bone, the knife must be kept close to it, lest the deep palmar arterial arch should be wounded. If any oozing of blood continue, let the wound be stuffed with lint, as recommended after amputation of the great toe, see page 214.

Not unfrequently the finger connected with the metacarpal bone is so diseased as to require removal at the same time, which is done in the same way as the great toe, see page 214.

Amputation of Thumb.—This is done precisely in the same way as the great toe, see page 214. It is represented in Plate XII. figs. 1. and 2. Here the bistoury should be kept close to the metacarpal bone, to avoid wounding the radial artery. An assistant ought to be prepared to compress the radial artery above the wrist. The after treatment is the same with that recommended for the great toe.

Amputation of Little Finger.—The little finger and the great toe are amputated each exactly on the same principle. See page 214.

Amputation at the Wrist Joint.—The patient seated on a low chair, one assistant compressing the brachial artery, as delineated in Plate XVII. fig. 5, and another holding the fore-arm firm, in a state of pronation, the operator, with a strong bistoury, makes a semicircular incision through the integuments across the wrist-joint, from the radial to the ulnar side; then divides the radial lateral ligament, opens the articulation, conducts the knife across, and divides also the ulnar lateral ligament; the joint being thus dislocated, the bistoury is conducted round the carpal bones, and a large semilunar flap formed from the palm of the hand, see figs. 3. and 4. of Plate XII. In making this flap, the pisiform bone, which gives insertion to the flexor carpi ulnaris, can be easily preserved, and if not diseased or injured, it ought to be so, as it

is of importance to save even one muscle with its fixed or bony attachment.

The radial artery should be first secured, next the ulnar, separating this from its accompanying nerve; thirdly, any other arteries requiring ligatures. The remaining steps and after treatment are the same with those recommended in page 205.

Amputation of Fore-arm.—When the operator has the choice, this should be done distad to the insertion of the pronator radii teres muscle. The position of the patient, and the duty of the first assistant, are the same with those for amputation at the wrist-joint, but the fore-arm is to be held in a state of supination, as drawn in Plates XII. and XIII., figs. 5. and 1. The surgeon, with his left hand, then grasps the muscular mass to form the palmar flap, transfixes this with a short narrow amputating knife close to the bones of the fore-arm, and makes a semicircular flap a little longer than the posterior; he next pulls the integuments and muscles on the anconal aspect, and enters the knife at the first point of incision, transfixes these muscles behind the bones, and brings it out at the second point of the wound, in other words, at the wounds of the first transfixion, and makes a flap corresponding to the first, only a little shorter. The reason for this difference in the length of the flaps is, that the palmar is the more fleshy, and forms a better cushion for the stump.

The radial and ulnar arteries, represented in Plate XIII., fig. 1, marked *a*, *b*, are near the margin of the palmar flap. When the ulnar nerve *o*, is too long, it ought to be shortened with the bistoury, to prevent neuroma forming.

If we amputate nearer the elbow-joint than the immediately preceding, the palmar must be considerably larger than the posterior flap. The ulnar artery in this case has not yet joined its nerve, and the latter commonly requires to be truncated.

Amputation at Elbow-Joint.—The position of the patient, and the duties of the first assistant, do not differ from those recommended when operating at the wrist-joint, see page 216.

The operator, with his left hand, grasps the integuments and muscles on the palmar aspect, transfixes them immediately anterior or palmar to the joint, and makes a long enough flap to cover the stump, there being nothing but skin behind. The flap is next reverted by another assistant, the joint opened first, by dividing the external or radial lateral ligament; secondly, the fibrous capsule and brachialis anticus muscle adhering to the coronoid process; and thirdly, the internal or ulnar lateral ligament. The articulation is now so far dislocated, that the saw can be with facility inserted, and the olecranon process of the ulna cut across. Previous, however, to doing this, let the integuments on the anconal or posterior aspect be incised transversely, so as to connect the extremes of the first or palmar flap. The saivng of the olecranon is important, for it leaves the insertion of the triceps, which, according to my own experience, ultimately renders the arm much more useful. For this improvement we are indebted to that able surgeon Mr Liston; the great Baron Dupuytren, the original inventor of the operation, removed the articular surfaces of both ulna and radius, which, I have to remark, is the more expeditious method.

The radial artery near the margin of the flap is to be first taken up, next the ulnar, deep among the origins of the flexor muscles, quite apart from its nerve, which latter must be cut short, and occasionally also the median nerve. Any other arteries, as the anastomotica, bleeding freely, are to be secured. The after treatment has been described at page 205.

Amputation of Arm.—When the surgeon has the election, it should be distad to the insertion of the deltoid muscle; and, as already stated, if amputation by the circular mode is admissible any where it is here, and not close below the knee-joint, since in this quarter the muscles encircle the bone regularly, while in the leg they are mostly all on the popliteal aspect.

The patient may be either sitting or lying, and an assistant should compress the axillary artery, where it runs superficially to the head of the humerus, while another assistant should as much as possible retract the integuments. The surgeon then makes a circular incision round the arm, right to the bone,

which he divests of its muscular attachments as far upwards or proximad, as he deems will make a good cushion hereafter. The saw is next applied close to this point, and the bone cut through. The brachial artery will be found surrounded with its veins and nerves, on the inner or ulnar aspect, and must be carefully pulled out with the forceps and tied; the profunda superior or inferior may also require a ligature; and if a high division of the brachial artery exists, there may be more. The sides and angles of the stump are to be regulated by the biceps and triceps muscles; these forming the flaps.

This circular manner of performing amputation can never form a proper stump; enough of muscle cannot be obtained to become a suitable protection to nerves and bone; and hence that great Nestor of surgery, Sir A. Cooper, acknowledges, that ultimately nothing but skin covers the end of the bone. This mode consequently is never to be practised. Allanson, and other writers, talk most absurdly of cutting obliquely upwards or proximad, to make a concave conical stump, the point of the bone being the apex, and the circular margin of the stump the base of the cone. They also propose cutting first the integuments, and retracting them; next the superficial layer of muscles, and retracting them; and thirdly, the deep layer, and retracting it from the bone. But even this mode of layer by layer does not enable the saw to be applied higher up or more proximal, and always ends in abscesses and sinuses.

Amputation at Shoulder-Joint.—This, like that at the hip-joint, is performed in a variety of ways; the simplest, in my opinion, is represented in Plate XIV., figs. 1. and 2. The patient lies on a low table with his shoulder free from its edge, and his arm held up by an assistant; the operator then grasps the outer or dorsal fold of the axilla, which he divides with a strong bistoury or small amputating knife, beginning the incision in the axilla, and terminating at the acromion scapulæ; this he is to deepen, and open the joint at the same time on its outer or dorsal aspect, by dividing the short muscles and fibrous capsula incorporated together. The knife is next to be carried cautiously round the head of the humerus, which is to

be pushed backwards or dorsad, and the long tendon of the biceps and subscapularis muscles, with the remaining portion of the fibrous capsule divided. Another assistant can now insert his fingers as depicted in Plate XIV., fig. 2., and grasp the inner flap with the axillary artery, so as to command hemorrhage, then the operator cuts this, of a semilunar figure, to correspond with the outer flap.

The axillary, or rather here the brachial artery, is seen in its bed of veins and nerves, and must be pulled out with forceps, and secured; next the posterior circumflex, which is generally wounded in the first incision, and requires the finger of an assistant to stem its bleeding during the operation; but little blood is lost, for such is the controul of the assistant over the hemorrhage, that I have amputated here, in the most delicate female exhausted by necrosis of the humerus. Any muscular branches which bleed freely should be tied. The after treatment is the same with that recommended in page 205, for amputation of the thigh.

END OF PART I.

Fig. 1.

Fig. 2.

Fig. 3.

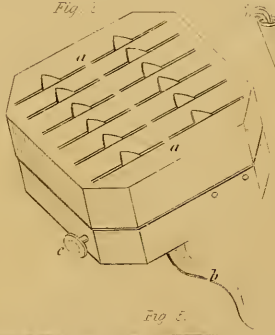

Fig. 4.

Fig. 5.

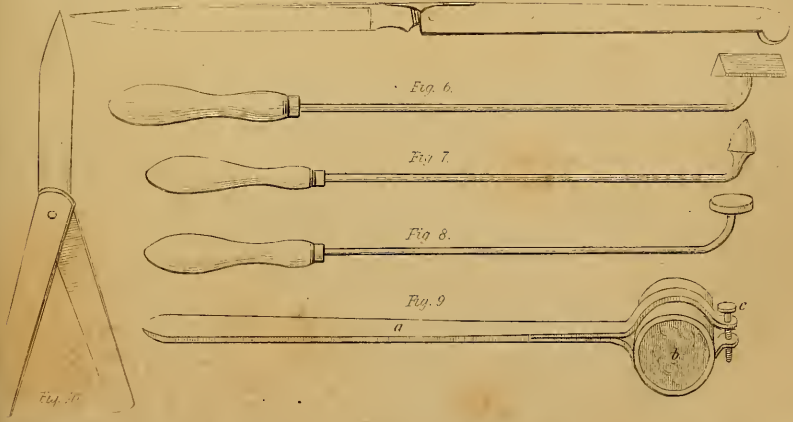

Fig. 10.

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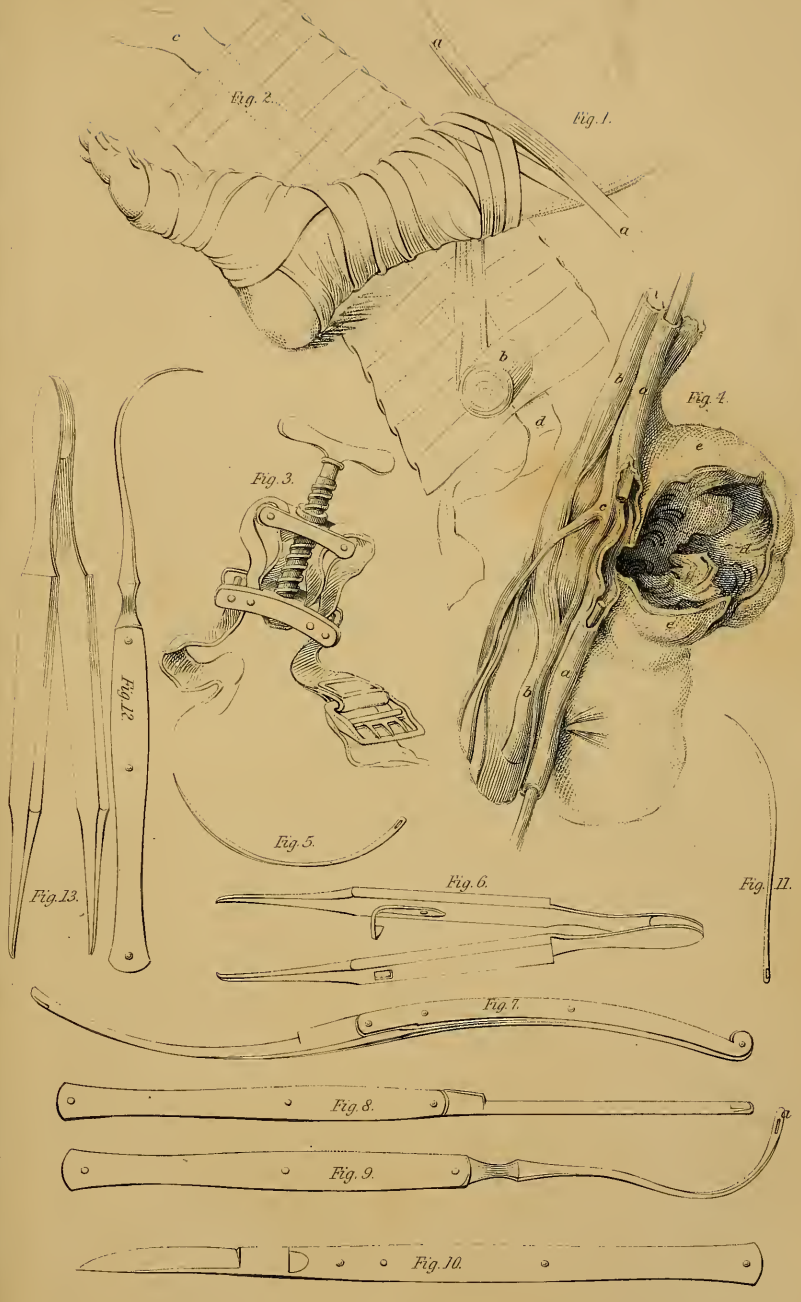

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Fig. 1.

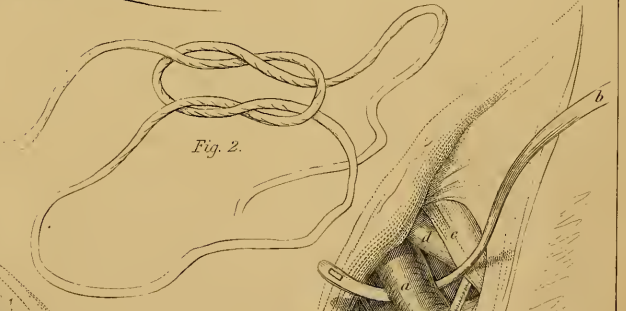

Fig. 2.

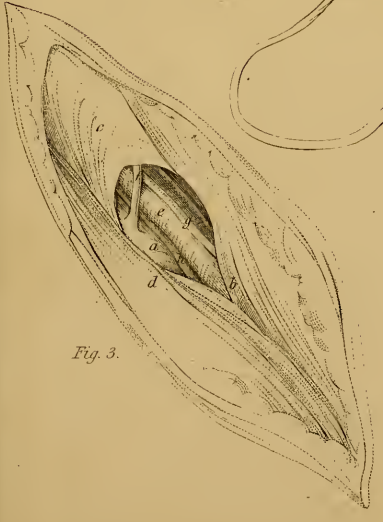

Fig. 3.

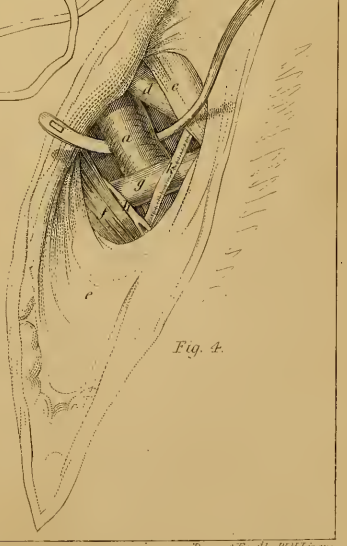

Fig. 4.

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Fig. 1.

Fig. 2.

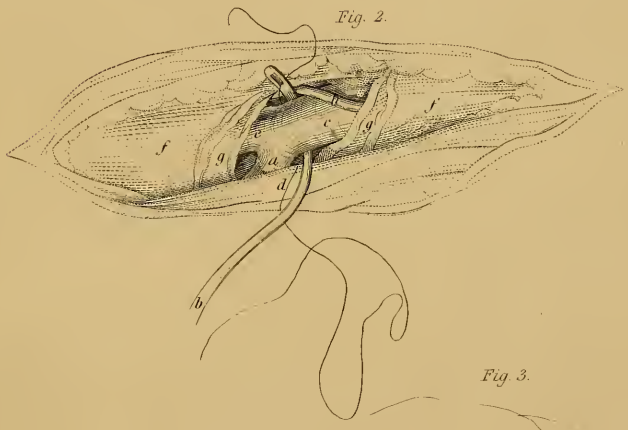

Fig. 3.

Drawn & Engd by W. H. Lizars

Fig 1.

Fig. 2.

Fig 3.

Fig. 4.

Drawn & Engd by W. H. Lizars.

Fig. 1.

Fig. 2.

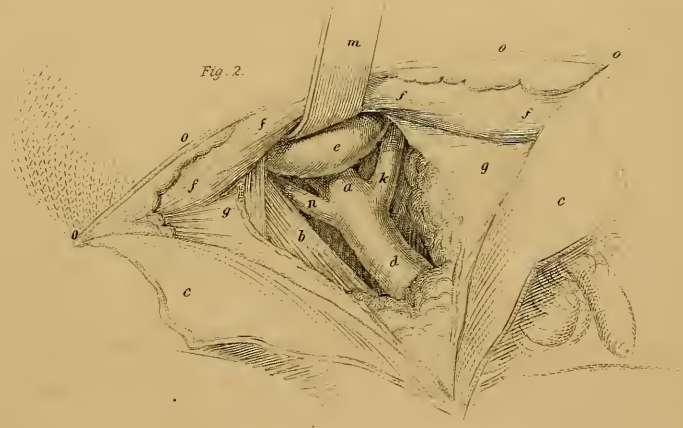

Fig. 3.

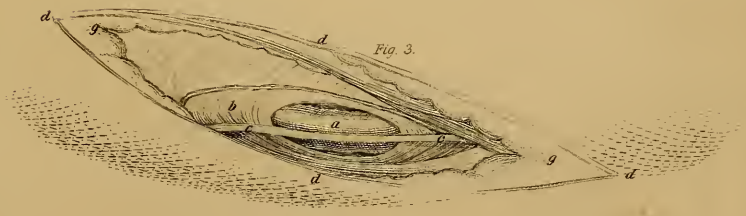

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Fig. 1

Fig. 3.

Fig. 2.

Fig. 4.

Fig. 6.

Fig. 5.

Fig 10.

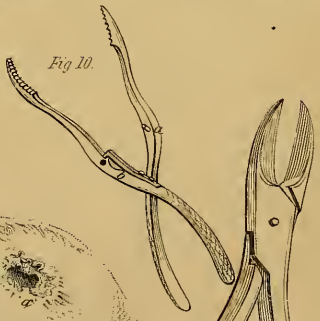

Fig. 11.

Fig. 9.

Fig. 8.

Fig 7.

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Fig. 1

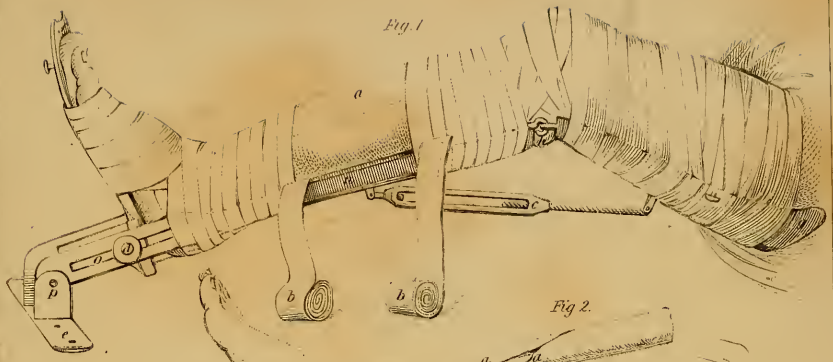
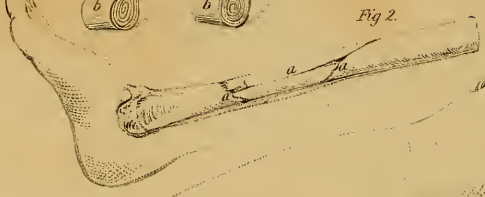


Fig. 2.



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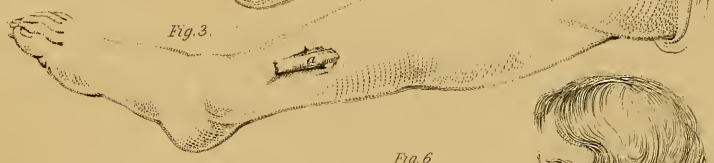

Fig. 5.

Fig. 6

Fig. 7.

Fig. 4.

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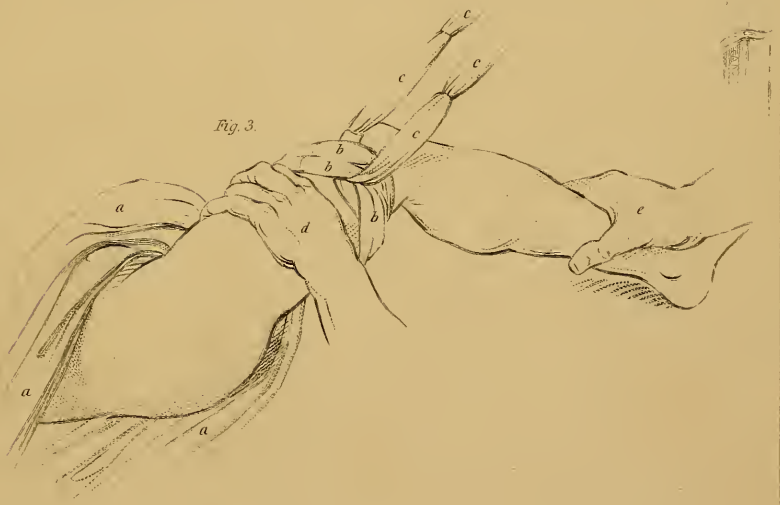

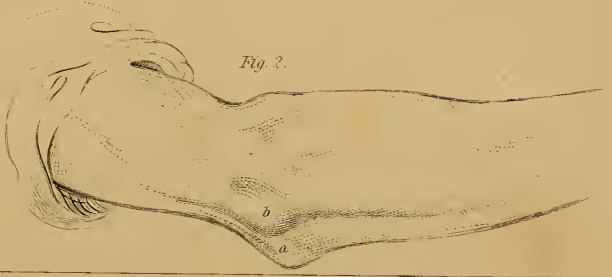

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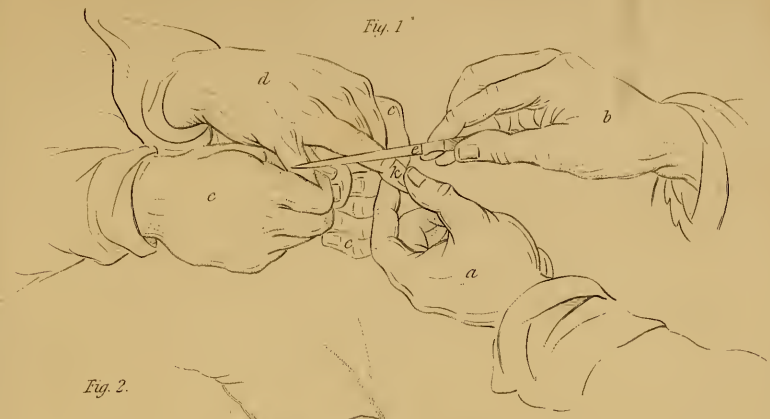

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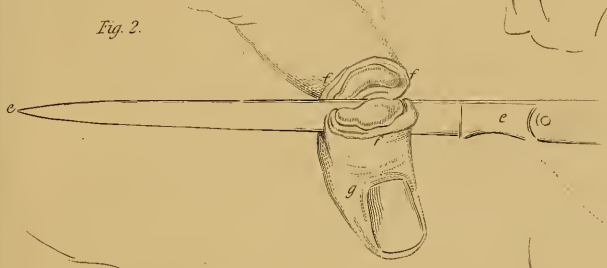

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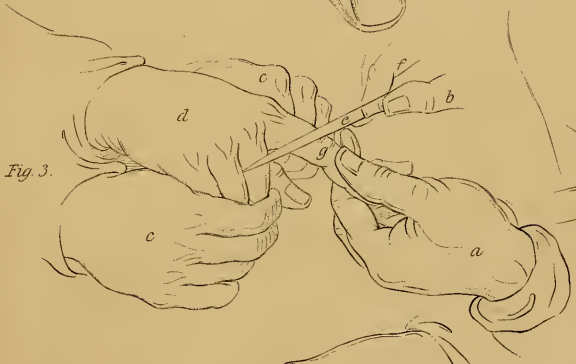

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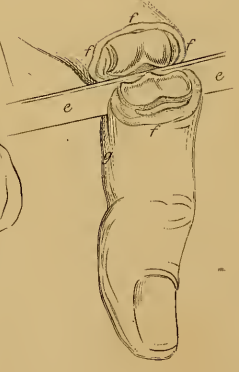

Fig. 5.

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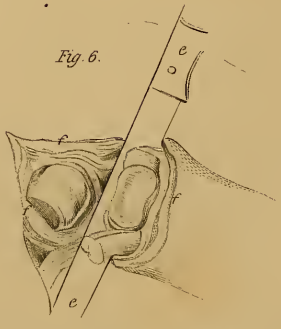

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Fig 1

Fig 2.

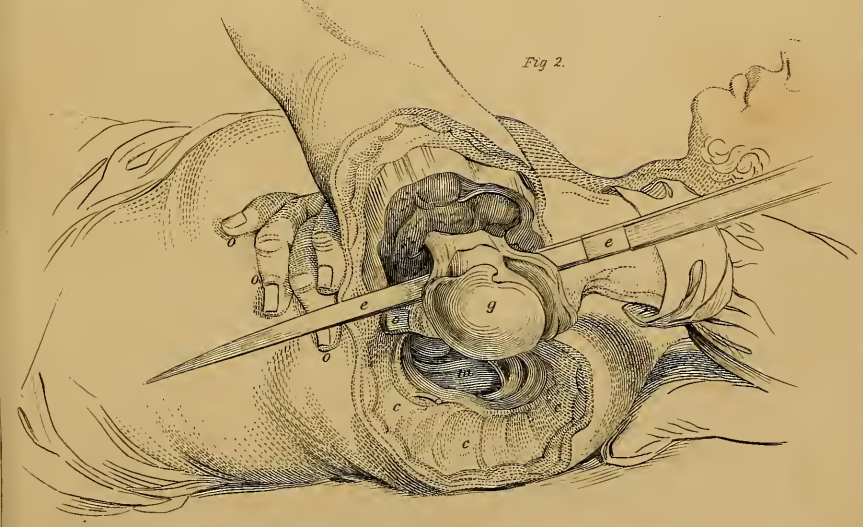
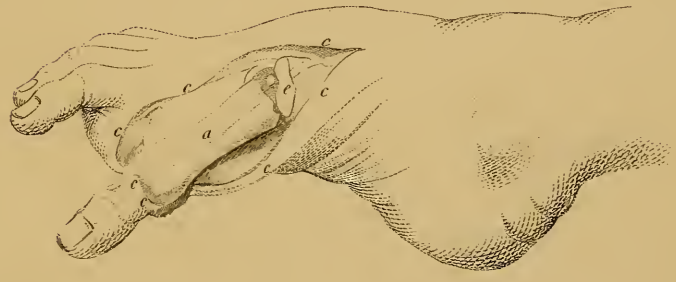


Fig. 1

Fig. 2.



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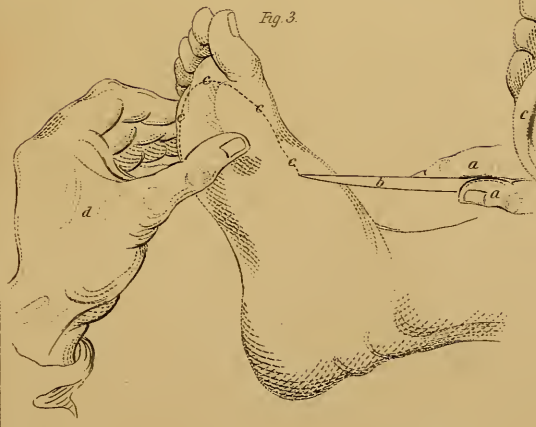

Fig. 4.

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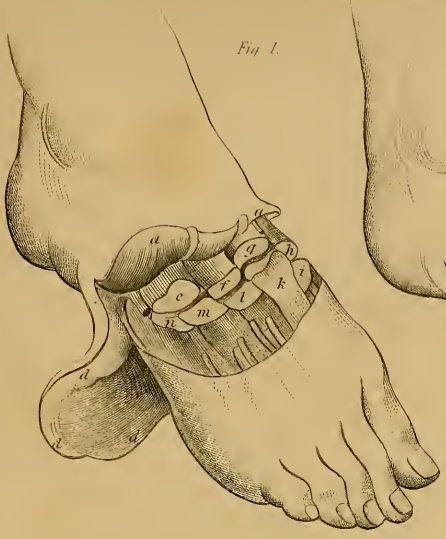
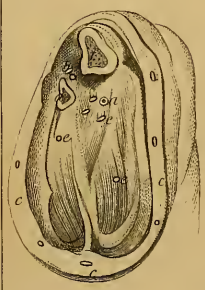


Fig. 2

Fig. 3.

Fig. 5.



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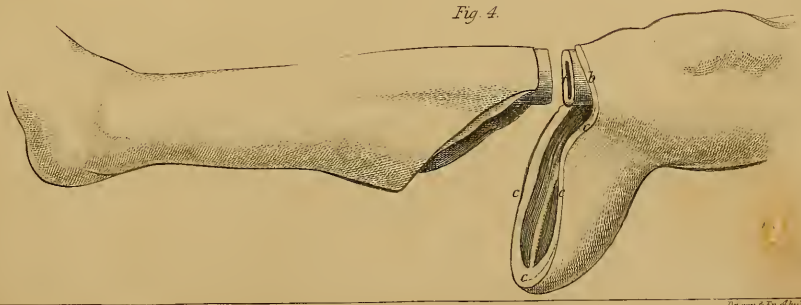

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Fig. 1.

Fig. 3.

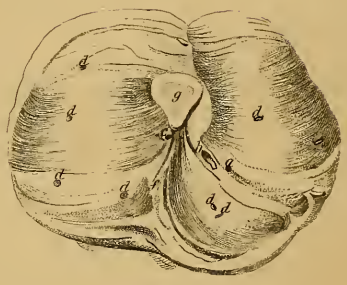

Fig. 2.

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Fig. 1.

Fig 2.

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